What's in this issue—

As section after section of the country becomes industry conscious and offers inducements to manufacturers to move their plants, **the**

HARRY BOYAR

plant owner must figure out for himself what the advantages of his present location are, and whether they are outweighed by those of some other place. In the New England Council, the oldest manufacturing section of the country has a strong organization working to hold its industries and attract new ones. Its president, J. W. Hook, a well known machine tool builder, gives the New England angle on page 215.

Stimulated by an article on wage payment methods printed some weeks ago, A. L. DeLeeuw, consulting engineer and former chief engineer of Singer and Cincinnati Milling, offers some strong opinions of his own on the function of incentives, page 223. He insists that **a bonus is, or should be, a part of the wage contract**, and not a bribe or a bait.

Ford is saving as much as 40 tons of steel a day in his Rouge stamping division by means of the extensive adoption of continuous feed from large coils of sheet stock for such parts as hood stampings and rear fenders. Two to four shorter coils are welded together to make one of the large coils used. Handling time is reduced but uncoilers have to be used to help the press feed pull in the stock. You'll have to read the article beginning on page 217 to get the whole story.

Speaking of sheet steel, **Republic opened last week a huge new continuous strip mill capable of rolling 98-in. strip.** Two pages of pictures, 226 and 227, give an idea of the size and performance of this unit, the biggest in existence.

Customers get more exacting and fussy, manufacturers pay more and more attention to the finishing of their metal products. G. Klinkenstein, technical director of Maas & Waldstein, describes **new finishes and processes developed during the last year.** Page 232.

The second installment of the three-part article on the making of controllable-pitch propellers at Hamilton Standard Propeller begins on page 221. Pictures and a bit of text explain **machining operations on the propeller hub barrel.** It must be very accurate to insure proper balance through correct blade spacing.

Some of the best work done in metal-working is to be found in the contract shops. The first of two articles on such a shop, Boyar-Schultz of Chicago, by Harry Boyar, superintendent, starts on page 229. **Equip-**

ment replacement occurs at a rate that would stun many a superintendent of a big shop.

COMING

In the next issue

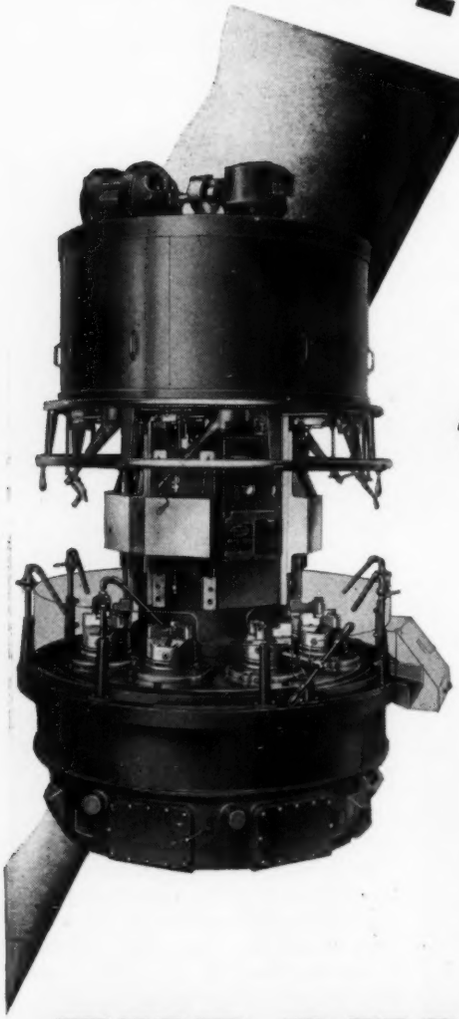
New England ingenuity, the traditional kind, saved something like a thousand dollars on an assembly job in Watertown Arsenal. A rough estimate showed that it would cost more than that to heat the external member for a shrink-fit job on a gun mount. At this point ingenuity entered. Instead of heating the outer part they froze the inner one at a small fraction of the expense. Our photograph shows the chilled part practically driven home.

Hitler's dramatic seizure of Austria has shocked Europe and even made some impression on the complacency of American pacifists and isolationists. England is thoroughly aroused at last. Questions in Parliament concerning the effectiveness of her air defenses have brought forth encouraging responses, and favorable references to the contributions made by the famous "shadow plants." An English correspondent has written a special story for *American Machinist* on this interesting development. In view of current happenings it is unusually timely.

In later issues

As the Australian government lowers its barriers against American imports a broader market opens for many products of the machinery and metal-working industries. How they feel about labor matters in Australia has a considerable bearing on this particular situation. A former McGraw-Hill editor and executive, the man who wrote the story on New Zealand in a recent issue, gives us a graphic picture of Australian labor experience.

CRAFTSMANSHIP IN YOUR PRODUCT



Via the MULT-AU-MATIC MACHINING METHOD

Craftsmanship . . . real Craftsmanship . . . in any product is desirable from the standpoint of durability and long life at Low Cost.

Accuracy and finish on parts subjected to high speeds and hard service are essential.

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Therefore, Craftsmanship on your work means better products. But, How Craftsmanship at Low Cost? BULLARD MULT-AU-MATICS. Through their design and construction, they naturally produce craftsmanlike work. Through their machining method, they produce this work at Low Cost. Let us tell you how Mult-Au-Matics can Lower your costs. Then, consider this equipment as Replacement units.

THE BULLARD COMPANY

BRIDGEPORT CONNECTICUT

AMERICAN MACHINIST

ESTABLISHED 1877

F. H. COLVIN • K. H. CONDIT • BURNHAM FINNEY, Editors

Mistakes to Correct

BEFORE it is too late Congress should correct several of the mistakes made in legislation passed during the last five years. The worst of these mistakes, from the point of view of the metal-working industry, are the Wagner Labor Relations Act, the undistributed earnings tax and the capital gains tax.

Passed with the pious intention of eliminating industrial strife, the Wagner Act has been extremely successful in stirring up all kinds of trouble. Advocates of this law point to the strikes settled by the N.L.R.B. under the law, and to the agreements reached that have prevented strikes. What they do not admit is that the great majority of these strikes or disagreements would never have happened if the law had not been passed, or if it had been passed as an equitable and reasonable act.

Successful collective bargaining arrangements have been broken down under this law, and much of the mutual respect and trust built up between men and management during the last generation has been undermined. As a non-union witness at the Bethlehem hearings at Johnstown put it when asked why he opposed C.I.O. organization: "We were afraid they'd upset our collective bargaining."

Senator Vandenberg has proposed a simple amendment that will correct the manifest injustice of the original law, and protect the working man from racketeering as well as from employer domination. It should be passed without regard to partisan politics.

BY THIS TIME it should be clear even to the obstinate theorists who planned the New Deal legislative program that the tax on undistributed earnings and the unfair tax on capital gains have not worked except to throttle business. Practical men in both houses of Congress and in both political parties have recognized this fact for some time. If the administration is obdurate, Congress should correct the mistakes made when these taxes were imposed, regardless of White House pressure. The House acted wisely in refusing to accept the infamous "third basket" levy on closely held corporations. A few of the ones at which this provision was aimed might have been hurt, but the main force of the blow would have fallen on active, small industrial corporations of the type that make up the majority in the machinery industry.

The Versailles Treaty attempted to prevent a peaceful union of Germany and Austria. That union has now been consummated under conditions that threaten the peace of Europe, and perhaps of America. It is now too late to correct that mistake. Shall we profit from that terrible lesson and correct ours before it is too late?

Gaging Business

SIGNS are visible of a slight upturn in the metal-working industries. Improvement probably is only of a seasonal nature and not yet pronounced enough to convince manufacturers that business is "over the hump." Steel mills are getting many more individual orders, though the total tonnage is light, and consumers are pressing for deliveries. Operations this week are at 33.7%. Automobile manufacturers are more or less resigned to reasonably low production and sales through the 1938 model year, but already are stirring themselves in connection with impressive tooling programs for 1939.

Mixed trends are reported in machinery circles with some equipment builders securing sizable orders and others in relatively poor shape. Agricultural implement and tractor makers are doing well with substantial spring sales in prospect. Construction awards are substantially higher than in the corresponding period of 1937, and there are indications that the government's housing drive is beginning to take hold. Shipbuilders are preparing for big times when the navy expansion program is launched, while airplane builders are booked to capacity for months ahead partly on foreign orders. *Business Week's* index of business activities stands at 57.3 compared with 56.9 two weeks ago.

CINCINNATI—Machinery makers report declining backlogs. Planer builders, however, are working at capacity. General Motors parts divisions at Dayton are operating three days a week with Frigidaire and National Cash Register on the same basis. Indiana machinery circles have been enlivened by expenditure of $500,000 by one buyer for 48 machines. Otherwise purchasers are tightly holding purse strings.

CLEVELAND — Machinery sales, thanks partly to foreign orders, are running ahead of those in February. Steel companies report the best increase since early November with the number of individual orders expanding. Executives remark, however, that the change for the better is not yet of sufficient duration to indicate a real trend. Auto parts makers are a little busier but still on short time.

PITTSBURGH—The steel trade is encouraged by a slight upward movement of the ingot rate. Increasing pressure for quick deliveries is proof that consumers have about exhausted stocks. Automotive tonnage releases have been disappointing; best demand is from agricultural implement companies. Steel prices seem firm. Machinery dealers are pessimistic.

NEW YORK—After a promising start this month, machinery orders have slumped and the March total may not attain the February level. In the Buffalo district a large chemical plant is enlarging payrolls because of growing sales and firms engaged in gear making and in heavy machinery manufacture are busy.

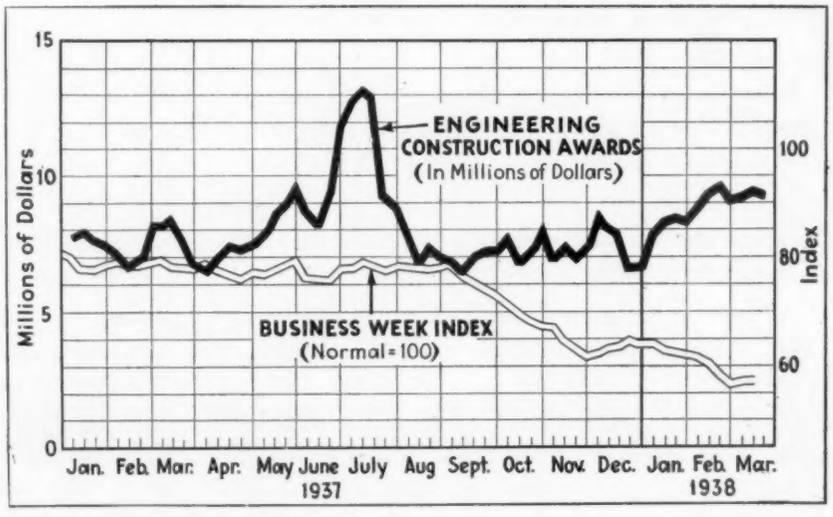
SAN FRANCISCO—Pacific Coast machinery dealers did not share in the February national upturn for the industry. Future favorable signs are conspicuously absent. The Government's armament program won't greatly affect the Far West. There is more talk of labor unrest but fewer actual strikes, most of which are of a jurisdictional character. A further decrease is reported in industrial employment. On the favorable side, home building continues good, March automobile sales appear better than those of earlier months and airplane factories are busy.

CHICAGO—There is no indication of an upturn yet. The tool steel industry is slowly getting rid of inventories and some manufacturers are pouring their first heats of the year. Agricultural implement and tractor people still are the best steel buyers. Though machine tool inquiries are in fair volume, placing of orders is being deferred and March may be the poorest month in several years.

NEW ENGLAND—Business is spotty. Machinery dealers report sparse orders, but electric apparatus makers estimate that this month's sales may equal those of a year ago in dollar volume. Textile mills are doing better. Pacific Mills notes moderate improvement in its worsted division, while Lawrence mills are running at 67%.

CONSTRUCTION VS. GENERAL BUSINESS

An exception to the rule in business indicators, construction work should continue its upward trend with the advent of spring



Why Locate in New England?

JAMES W. HOOK
President, New England Council

IF YOU OWN or operate a metalworking plant, large or small, you have probably wondered more than once whether it would be better to stay where you are or to move the plant to some other part of the country where prospects look brighter. You have doubtless read alluring advertisements from New England, from the Middle West, from the Far West and more recently from the South. You have been approached by high-pressure salesmen from various communities and regions. So have I, and my own plant is still in New England and will remain there.

My reasons for remaining in New England are likely to be the same reasons that have kept other manufacturers here and have attracted plants from other parts of the country. I give them to you at the request of the editors of *American Machinist.*

New England is not the ideal location for every kind of metalworking, but it has definite attractions for certain kinds of metal manufacturing. It has traditions. It made the first iron, built the first textile machinery, developed the machinery for making shoes and started the machine tool industry. No one of these things could have been done without the ingenuity and skill for which New England craftsmen are famous.

Today traditional New England craftsmanship is one of her major assets. If your product is one containing a large element of "brains" you will find New England a satisfactory place in which to build it. One of my manufacturing friends puts it in slightly different language. He says that it pays to make in this region any products where the material cost is not more than one-third of the total cost. Machines of this type represent a transfer of the skill of the designer and craftsman to a mechanism that can be operated by individuals without skill.

Now why should New England be particularly suitable for this kind of manufacturing? Because men of this type appreciate attractive natural surroundings, pleasant communities in which to live and stable financial conditions. All of these things New England has.

Furthermore, New England has organized itself to maintain and develop these advantages still further. The New England Council which was established in 1925 has functioned not only to retain what it had, but to stimulate growth and to attract new assets. Its industrial division is divided into two sections; one engaged in conserving and developing, the other in promoting and selling. The first of these two sections encourages communities to study their debt problems, their natural facilities, their training of skilled labor. It promotes research and endeavors to aid in the development of new products to be made in New England plants. The second section applies advertising and publicity to the spreading of the news of New England's advantages elsewhere and cooperates with the industrial development departments of New England railroads, power companies and local bodies.

All of these things you can get in detail from the New England Council itself. I mention them here because I believe that a community that has this cooperative spirit and has organized itself to make that spirit effective, is a good one in which to have one's shop.

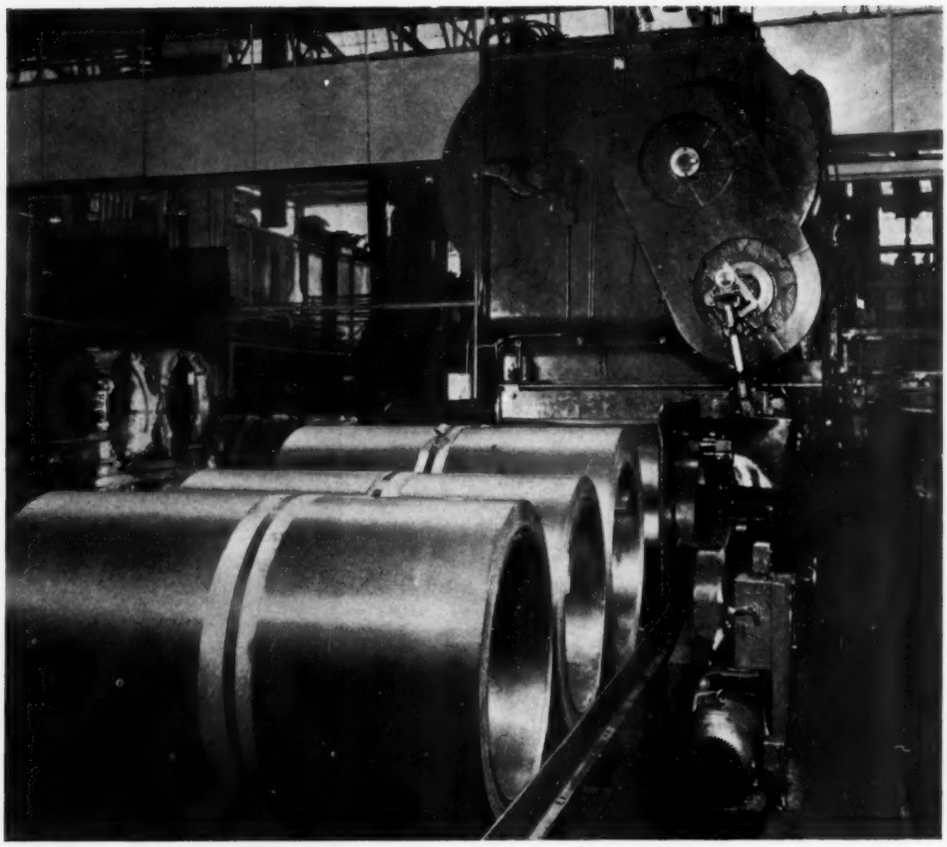


Fig. 1—Multiple coils made by butt welding large sheets are fed from synchronized uncoilers to blank the Ford hood stampings

Coiled Sheet Saves Steel

Wastage is reduced and press time is cut by the use of continuous feed in the Ford Stamping Division

A. F. DENHAM
Detroit Editor, American Machinist

Fig. 2—Fender blanks are preformed by hand before going to the drawing press

UP TO 40 tons of steel per day, depending on volume of production, are being saved in the stamping division of the Rouge plant of the Ford Motor Company largely through the extensive adoption of continuous feed from large coils for such parts as rear fenders and hood stampings.

These coils of wide sheet steel, weighing 7000 to 15,000 lbs., are obtained by welding together two to four shorter coils. Whereas much material at the end of single sheets formerly had to be scrapped, this no longer is necessary. There also is no time lost in handling or feeding the stock into the press.

The continuous feed coils also make possible the staggering of dies in the press in such manner as to reduce wastage in each blanking operation to a minimum. In some cases parts are stamped right through the weld, particularly those parts not involving deep drawing operations later. Where deep draws are to follow, welds are usually cut out as the steel is fed through the press.

To make possible the use of such large coils, the sheets are butt-welded before pickling. Welders for this operation have been installed not only in several of the rolling mills supplying Ford, but also in Ford's own mill. The flash from the butt-weld is sheared off on a special broach equipped with a plow-like knife, broaching from the center out towards both edges of the welded strip as it passes continuously through the shear.

An example of the use of wide

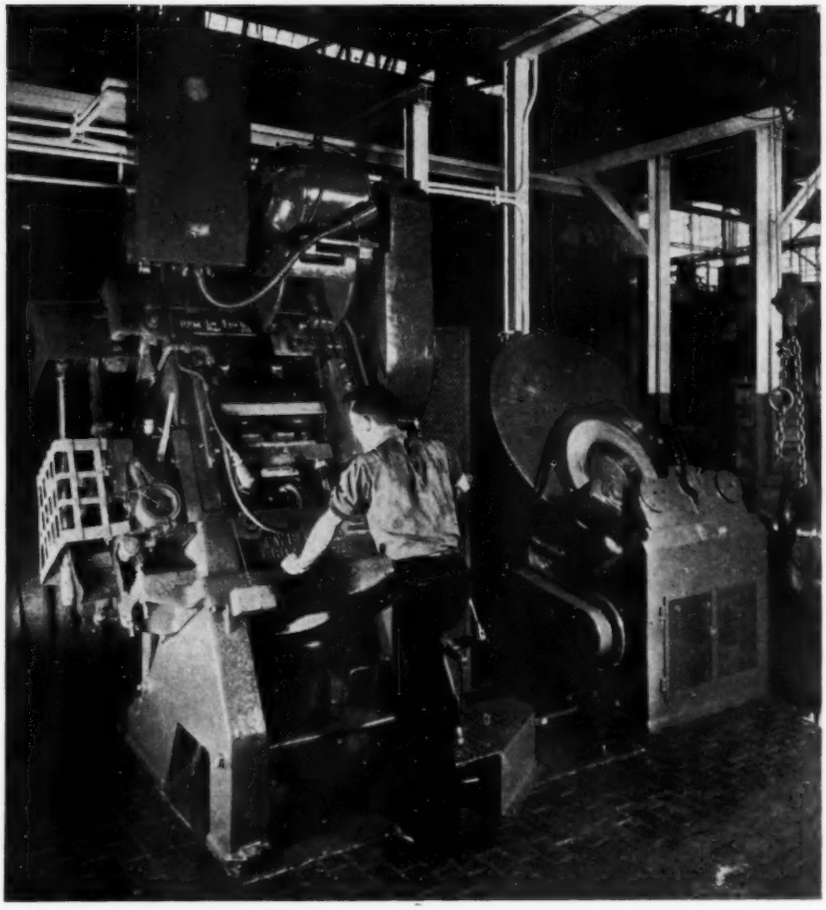


Fig. 3—Stock for carburetor throttle levers is fed to the press by means of an automatic uncoiler with electric tension regulator

multiple coils is shown in Fig. 1, where hood top stampings are blanked two at a time from 20-gage stock 62 inches wide. The coils are placed on a special bed adjacent to the press by means of overhead cranes. The coil closest to the press in Fig. 1 is resting on the rubber rolls of an automatic mechanical uncoiler.

Un-coilers have to be employed, since the press cannot pull the sheet through from such heavy rolls. The un-coilers are synchronized in operation with the press, feeding the sheet as the head rises. To prevent interference with the stamped parts, the press is equipped with vacuum cups which pick up the finished parts as the head rises, permitting sheet steel from the coil to feed into position for the next stamping operation, below the finished parts. At the top of the stroke, the vacuum is automatically broken and the stampings drop down for removal—one on each side—by the operators.

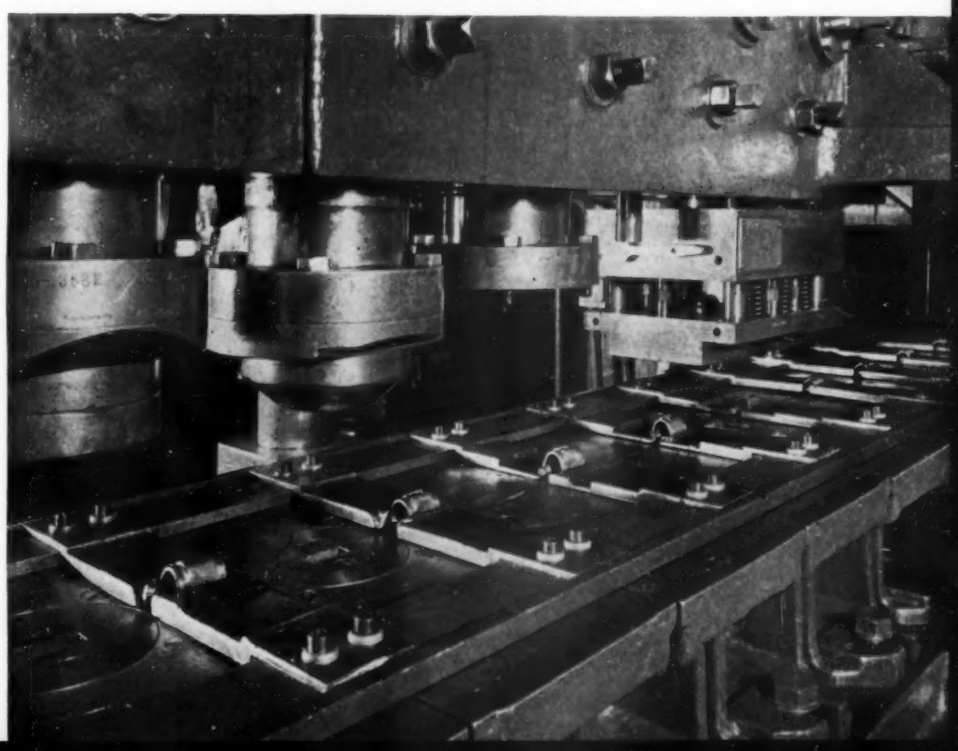
Similarly, front fenders are stamped from 41¼-in. coils weighing approximately 11,000 lbs. In this case, fenders are blanked one at a time, and at the same time are pierced to permit their being hung later on a conveyor. Up to 4000 fender blanks have been handled per press in an eight-hour day with this arrangement.

The blanks from this operation are next passed through a roller leveler, which also coats the blanks with soap solution for drawing. They are then preformed by hand, Fig. 2, and then go to adjacent Clearing forming presses for drawing. Rear fenders are stamped from 48-in. wide coils in a similar manner. Usually a number of flat sheets are carried in stock adjacent to the press as a safety measure in case of trouble with the un-coilers.

Automatic presses fed by coils are also used for a large number of smaller parts in the Ford plant. A typical example is the Bliss press used for stamping out and piercing carburetor throttle levers (Fig. 3). The automatic un-coiler is located to the right of the press. It is provided with electric switches operated by the unrolling coil itself to regulate automatically the amount of slack ahead of the press. Finished parts drop through into a hopper at the rear of the machine. Ball ends on the carburetor throttle levers are later formed at the Ford carburetor plant in Northville, Michigan.

An interesting continuous nine-stage automatic press blanks, pierces and forms the complete sleeve for the Ford steering wheel lock. This part is rather fussy as to tolerances. A progressive Hilo press is used. Stock, ¼-in. thick, is fed into the press from coils. After being blanked, the piece is automatically picked up and moved to the next set of dies, then to the third and so on, through the press, the last stage being a final sizing of the formed completed sleeve. The mechanism which moves the parts from stage to stage may be seen in Fig. 4 on top of the bed of the press, in the process of moving the set of parts in various stages of completion to their next stage.

Fig. 4—Steering wheeel lock sleeves are progressively blanked, pierced, formed and sized in a Hilo press



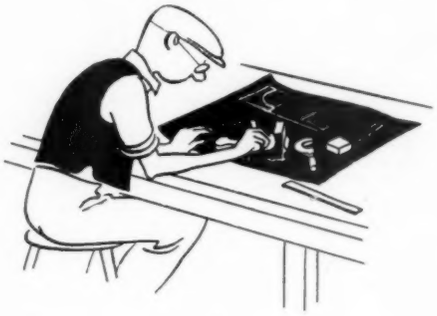
The Foreman's Daily Dozen

JOHN HAYDOCK
Managing Editor, American Machinist

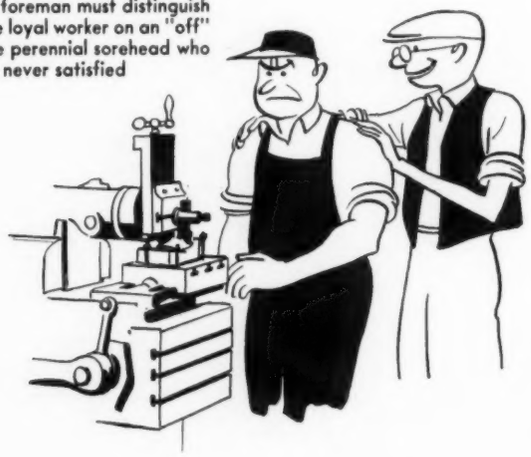
The foreman has no time for setting-up exercises and usually doesn't need them; but he must exercise considerable effort in understanding his men if he is to hold the respect to which his responsibilities entitle him. Pressure of his daily duties leaves little room for softness or sentimentality but it should not crowd out the human side of his job. For to most of his men the foreman personifies management, and through his leadership their loyalty is won or lost.

1 FAIRNESS. First essential in a foreman's make-up is unswerving justice in all his dealings. Nothing rankles so much with a workman as the feeling he has received a raw deal

4 SYSTEM. Orderly planning of job assignment leads to smooth work flow and increased departmental efficiency; for his department is the foreman's business, and methodical management never hurt any business



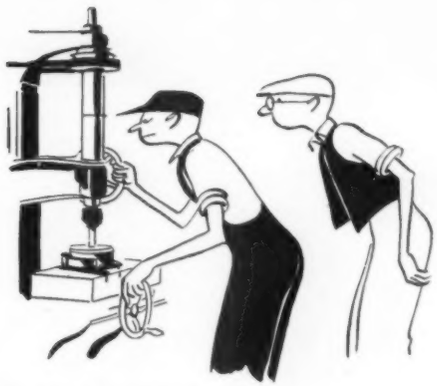
7 TOLERANCE. All of us have days when we are jumpy or grouchy. A foreman must distinguish between the loyal worker on an "off" day and the perennial sorehead who is never satisfied



9 KNOWLEDGE. A foreman's grasp of the business should go beyond the routine in his department; only by facts is he able to refute faulty notions on shop costs or company policies

8 PATIENCE. If a man doesn't understand instructions the first time, take time to explain them again. It's better for him to feel sure he is right than to have him use the bluff-and-blunder system that leads to spoiled work

2 LOYALTY. A foreman must be loyal to his men and loyal to his management. On his attitude depends the mutual good feeling of both



3 JUDGMENT. A foreman need not be the best mechanic in his department, but he should know good work when he sees it and a good man when he meets one

5 APPRECIATION. An approving word for work well done adds zest for the job and is sure to stimulate zeal for the future. A pat on the back takes only a second but may be repaid in hours of conscientious effort

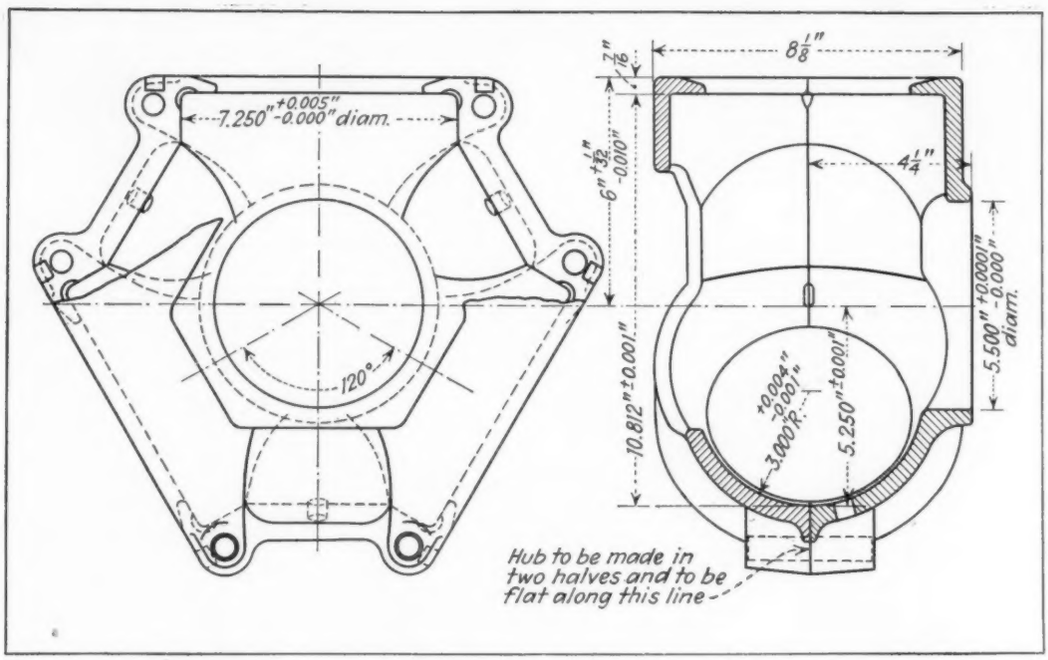
6 PROGRESSIVENESS. A foreman who keeps informed on new materials and equipment helps himself and keeps his men on their toes. A wide awake department is always a prolific source of better methods

10 INTEREST. It may be a far cry from shop output to Bill's wife's new baby; but the foreman's interest in his affairs usually bolsters Bill's interest in the shop. The personal touch may uncover pet peeves that can be cured before they grow into grievances

11 PUNCTUALITY. A good example is the best prescription for promptness and regularity. Discipline in the department depends largely on a foreman who follows the rules himself

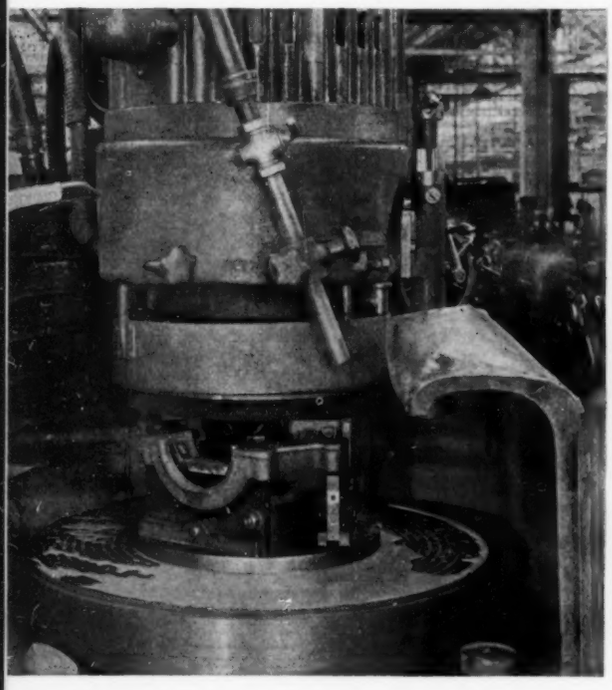
12 GOOD HOUSEKEEPING. Just as dirt breeds dirt, so neatness begets neatness; a tidy shop increases safety and fosters pride in performance

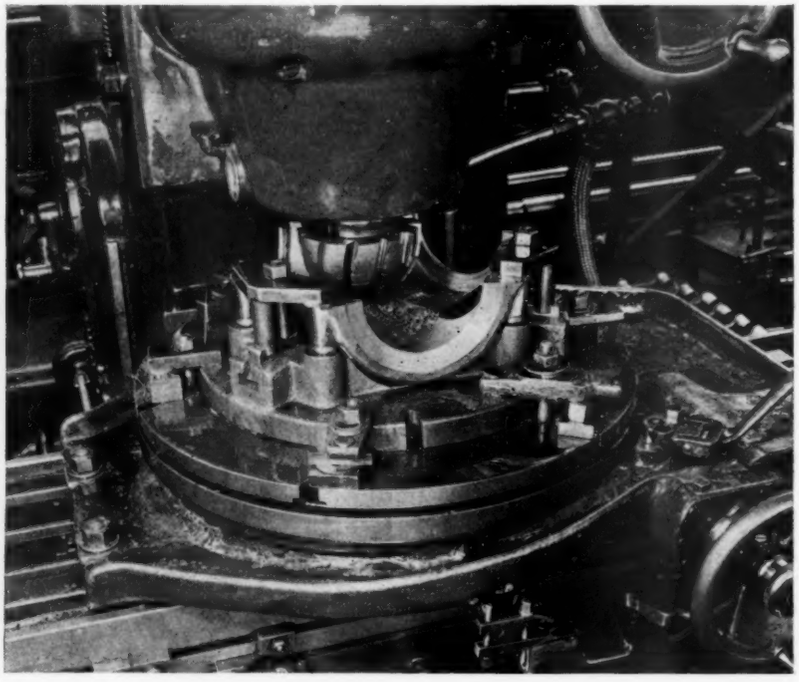
Controllable Pitch



The hub consists of an outer barrel into which the blades fit and an inner spider which drives them. The barrel is in two parts each of which is a chrome-vanadium steel forging (SAE 6135) heat-treated to a tensile strength of 135,000 lb. per sq. in. and a Brinell hardness of approximately 305

Left below. The half barrel is first surface ground on both sides in a Blanchard vertical machine. An equalizing fixture holds each of the three arms in a hinged bracket giving the equivalent of three-point support. The work is clamped from the inside by means of a single nut in the center of the fixture. The clamping spider carries adjustable screws. After the joint side has been ground the piece is turned over to grind the opposite face. *Right below.* A large forming cutter is used to machine the inside surface. The tool is used in conjunction with a Cincinnati vertical milling machine. Mounting the fixture on a circular table enables it to be indexed for the arms





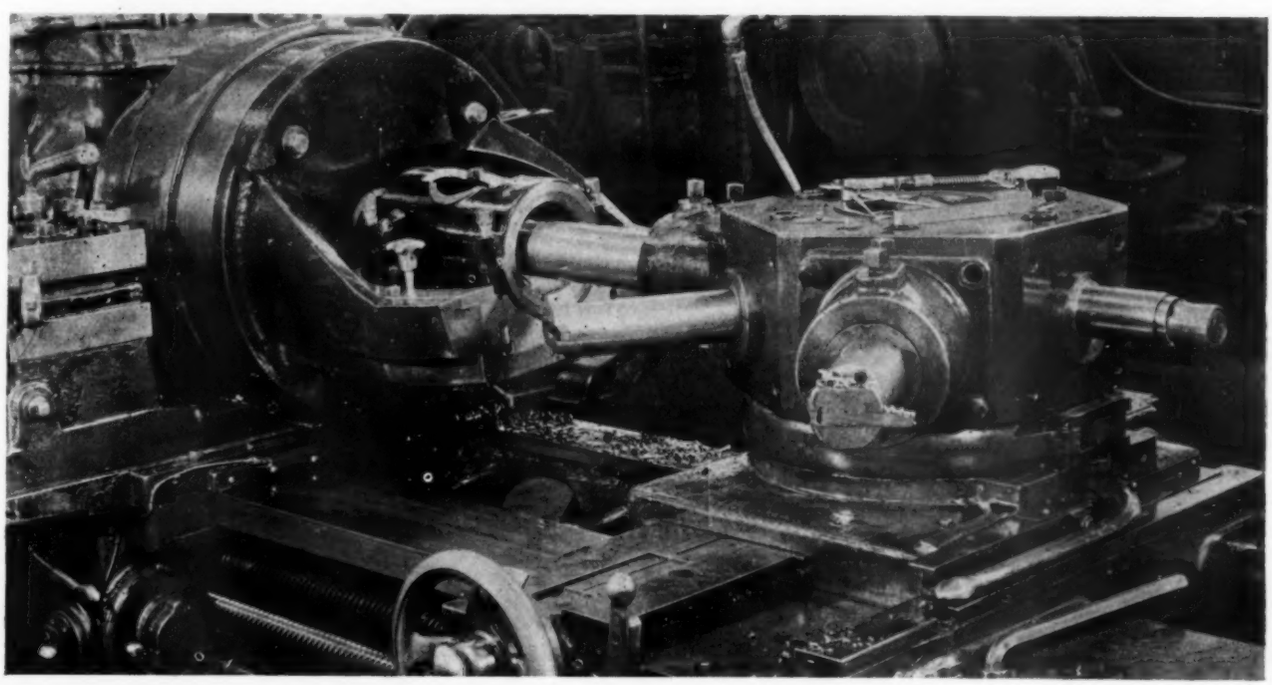
Propellers in Process

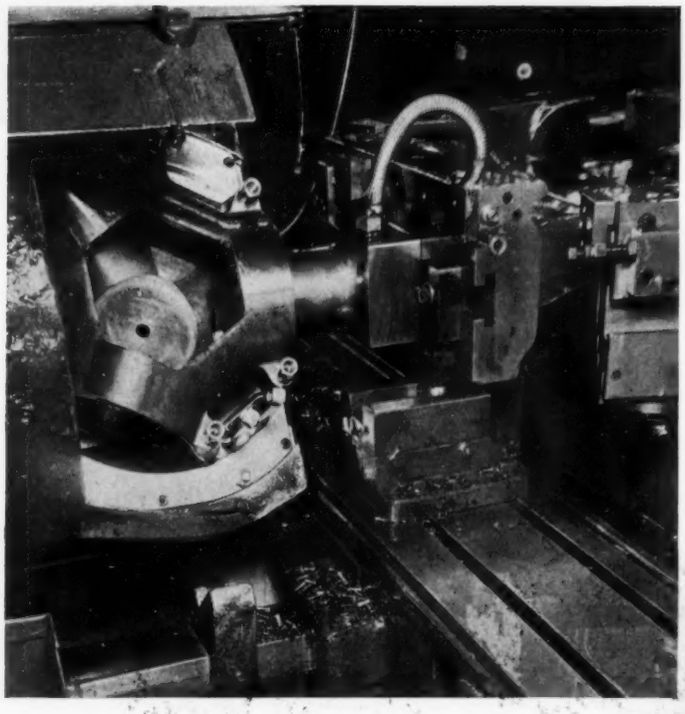
II—A previous set of pictures described the machining operations on the blades of Hamilton controllable pitch propellers. The views on this and following pages show some of the major set-ups used for work on the hub barrel. This member must withstand the high centrifugal forces which the assembly meets in service. Upon its precision rests the accurate location and spacing of the blades so necessary to proper balance. Since the barrel is a key member in the assembly long experience and special care are reflected in machine selection and tooling.

In addition to the blade and the barrel, two other important units of the Hamilton propeller are the spider and the counterweight bracket. Machining operations on these parts will be shown in an early number.

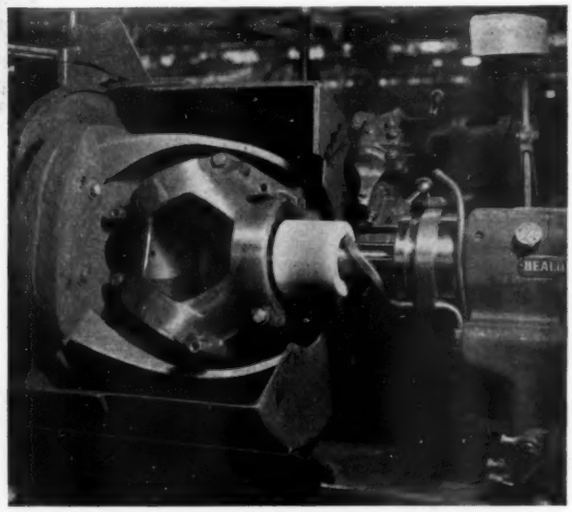
A piloting fixture guides the cutter bar when the barrel is bored. Note the quick acting clamps mounted in T-slots and the sheet metal collar for directing the coolant to the toolbits

After barrel halves are bolted together, blade bearings in the assembly are bored and faced in a Potter & Johnson turret lathe. The work is chucked in a cradle-like indexing fixture as illustrated for a two-blade hub barrel



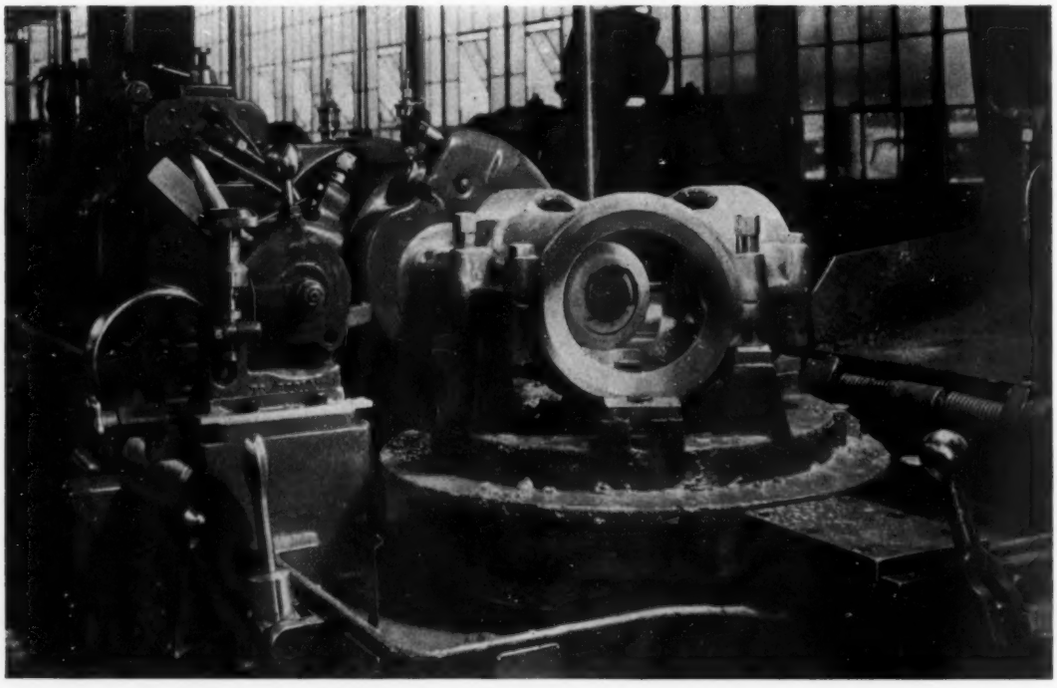


For machining the three-blade barrel the turret is equipped with horizontal tool slides and the tool head carries a guide pin. When the turret is fed into the workpiece, the pin is led into a slotted block clamped to the cross slide of the machine. By this means cross feed is obtained for the tools at various turret positions, making it possible to rough and finish face the barrel flanges, inside and out, in the same setup used for boring. The cradle fixture is so arranged that the barrel can be indexed to three positions for machining the recesses for the blades



In an indexing cradle similar to those used on the turret lathes the barrel assembly is located from the center hole for grinding the blade bores

The 3-in. radius between the barrel arms is ground in a Heald machine equipped with an oscillating head, to clear the wheel when it is withdrawn from the work. Again an indexing arrangement is in evidence on the fixture with a quick-acting locating pin to hold it in place



Buy—Don't Bribe

A bonus is part of the wage—not a bait. Used properly it affords a tangible reward for intelligent effort. Used unwisely it becomes a wasted gesture that defeats its own end

A. L. DE LEEUW

TO SPEAK of incentive implies that the workman has not given as much as he should and that we have found a way to coax him to some extra effort. That is not the proper way to look at the relation between employer and employee. It presupposes that the boss is trying to short-change the man—from the standpoint of the man—and that the man is trying to loaf on the job—from the standpoint of the boss.

As a matter of fact, this was not the underlying idea for the various systems that were based on incentive. All of these systems were attempts to bring the relation between the man and the boss down—or should I say up?—to that of buyer and seller. It was realized that the system of wage payment by a fixed rate per day was not definite. The man knew what he would get but the boss did not know how much to expect.

Ideal in Principal Only

Looking at the relation between employer and employee as that between buyer and seller, we see at once that the piece-work system is the ideal one in principle. There is the man who gives a definite amount of product, and there is the boss who gives a definite amount of money. Fundamentally, this system is correct. Unfortunately, what is fundamentally correct, does not always work out in practice. The piece-work system would work well if we could change human nature to conform to the system.

There are a number of things that get the piece-work plan into trouble. Some depend on the frailties of the boss, some on those of the man, and still others on the fact that conditions are not static.

Suppose piece prices have been set in some shop with proper regard for justice and with the greatest possible accuracy. Suppose the system works to the satisfaction of all concerned for a few months. The employer finds that his profits are not what he thinks they should be. He is tempted to reduce the rates. Suppose the men do not get as much money that way as they expected to get under the system. They are tempted to rebel. Greed has spoiled the system.

That it is very difficult to set rates that are absolutely perfect adds to the confusion. The writer does not believe that it was ever done. In most cases that have come under his observation, rates were set haphazardly. If a man turned out ten pieces a day, and the employer estimated that he could turn out twenty with some extra exertion, the rate would be set so that the man could make his day wage if he turned out fifteen. If everything came out as expected, the employer would get fifteen pieces for the price of ten and the employee had a chance to increase his daily wage by 33⅓ per cent if he made twenty. That the man had to work at too fast a rate was not considered. If he turned out 25 pieces instead of twenty, this was not considered as proof of the man's superiority, but as proof that the boss had made a mistake and that a lowering of the rate was in order.

No Incentive to Improve

Injustice was not all on one side. When high-speed steel was substituted for carbon steel tools, the man would object to a lowering of the rates. He felt that the rates should be sacred under all conditions. As a result the employer had no incentive to improve machinery and tools. I have found the oldest and most decrepit machinery in shops where the piece-work system had been used for a number of years.

Then there is the fact that not all men are equally efficient. The slower men hate to see others make high wages, not because they envy them, but because they feel, and think they know, that high wages for some must lead to lower rates for all.

The day-rate plan is no better. A man is supposed to get so and so many dollars for so and so many hours, but the employer cannot do anything with these hours unless they are used for production. In some cases the day-rate plan is the proper one. For example, it is properly applied in the case of the repair man.

Diligent Man Slows Down

It is not right that the lazy or inefficient man should receive the same wage as the competent and diligent one. The latter recognizes this consciously or unconsciously and slows down. If men work under a competent or, it is perhaps better to say incompetent, foreman, they will be driven to produce more and what this leads to every one knows. The whole day-rate plan is based on the idea that the man should be paid for the number of hours he gives to his employer.

Having disposed of the piece-work and the day-rate plans, we now come to the plan that was heralded at one time as the final solution of the problem of how to get pleasant and just relations between employer and employee: the premium plan. That it was a brave attempt is recognized, and so is the fact that it did not last. As is well known, this plan consisted of setting the time for the various operations to be done in the shop. If the man succeeded in finishing the operation in less than this standard, he would receive pay for the amount of time actually spent and a part of the time saved. This was supposed to give the man an incentive to cut the time and so earn more money. It would also reduce the cost of the operations and so be of benefit to the employer as well. The underlying

principle was correct. It was a plan by which both parties would profit.

That some employers would gradually reduce the premium was one of the reasons, but by no means the main reason, why the plan languished, and can hardly be said to exist any more. There were a great many employers who honestly kept their promises to the men, who never attempted to cut the premium, but who had to acknowledge in the end that the plan did not work. Let us analyze the reasons why this was so.

The first requirement in this system of payment is that a time shall be set for the operation. Before we can do so we must have an idea of just what this means. Is it the least possible time in which the very best man can do it? If not, what is it? The answer is generally that it is the time in which the average man can do the job, which brings the question down to the much more difficult one of what is an average man and how much he can produce.

Time Set by Hunch

In a majority of cases that have come under the observation of the writer, no attempt was made to study the time elements. The total time for the operation was set by what was called experience, and what might better be called intuition or hunch. If the experience was gained by noticing how long it would take an extra good man to do the job, the time would be set too low, and if it was gained by seeing what an inefficient man or a loafer could do, it would be set too high. As a rule, the management did not know with certainty whether the man was of this or that kind.

The next stumbling block in the path of the premium plan is the determination of the additional time to be allowed for the work. Either too much or too little is bad. As a matter of fact, it is not possible to say what percentage is proper, for what may be the ideal percentage for one man may be altogether wrong for another one.

Suppose it is decided that a certain piece of work can be done in ten hours by a fairly capable and diligent man. The question then is: what time should be set for this work? If it is set at twenty hours, the man can reduce the time to fifteen without worth-while effort, and thus get a fair addition to his wages, while the management pays too much for the work. If it is set at twelve hours, most men would not think it worth-while to go for it. The effort would be too much and the gain too little. In many cases that have come to my knowledge, the addition was 40 per cent, more or less. If the management and the man divided the saving evenly, it would be possible for the man to increase his wages by 20 per cent, or, if he were of unusual caliber, he might do even better than that.

This manner of dividing the gains is an important matter. If the percentage the man gets is too low, it ceases to be an incentive; if it is too high, the management does not profit by the system. In practice it has varied between one-half and one-third as the man's share.

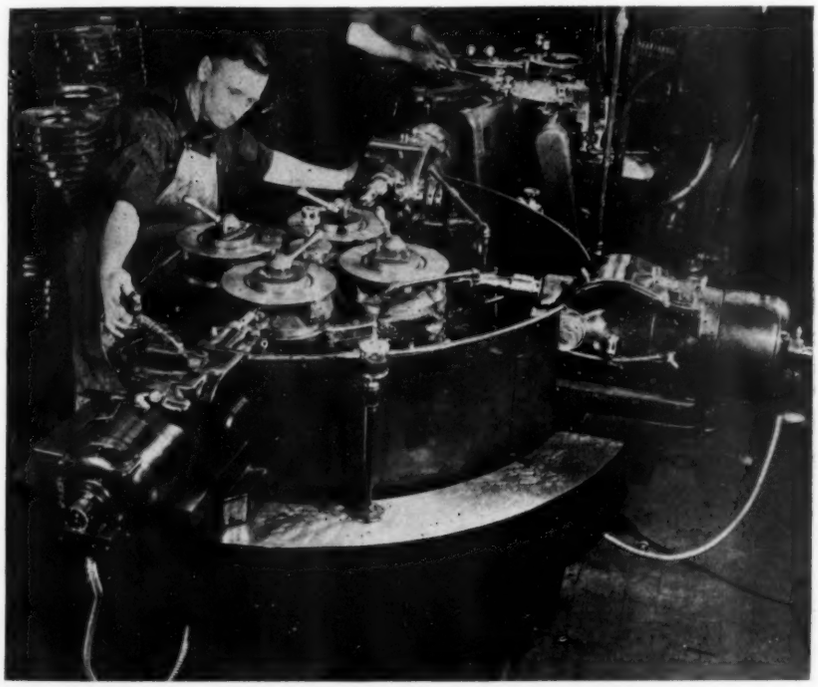
The real trouble with this plan is the same as with the piece-work plan. Once it is set going, the management becomes a looker-on. It has nothing further to do. All effort must be made by the man. The first part of the reduction in time comes quite easily, but to reduce that time further requires more and more effort, and only the best men will get the full premium.

If a belt should slip, if castings came hard, if tools were not properly sharpened or were of poor quality, the man would lose some of his premium by causes he could not control. He could complain about these things, but too much complaining would get him a bad reputation and not much relief. As a rule the men would take most things as they came.

The schemes of setting a piece price and increasing or decreasing it according to the output did not give the expected results. The scheme of raising the rate with increasing output, as proposed by Taylor at one time, led to setting the starting price too low, and so discouraged the average man. The scheme of reducing the rate with increasing output led to setting the starting price too high. The men would scoop off the cream, and did not bother themselves with further increase of production. To the best of my knowledge, neither of these schemes is in use at the present time.

All of the foregoing plans fail more or less because there is a lack of definiteness. With the day-rate plan the amount of pay is definite, but what the employer gets in return is not. With the piece-price system both pay and output are definite, but the conditions surrounding the plan are indefinite. The same is true of the premium plan. All these complete or partial failures of the various plans described, lead to the conclusion that, if any plan of payment shall be successful, it must be based on well defined terms and conditions.

These conditions are met by the task and bonus plan, if properly carried out. It is a pity that this plan carries this misleading name. It prob-



A contractual relationship is the essence of the task and bonus system; under it the man feels free to criticise the condition of machine, tools and material and becomes an inspector, thereby helping to raise the plant efficiency

ably originated with the Taylor system, which considered the man's work as a task to be performed by him. A better name for the plan would have been: *The definite contract plan,* for it is based on a definite understanding between employee and employer, and presupposes certain definite conditions of machines, tools and work piece. It bears the relation of buyer and seller. It instructs the man as to how he can earn a definite amount of money, but it leaves him free to earn it any other way. It permits the employer to change the contract price, but only when some new condition has arisen, such as new tools or machines, and then only to the extent that the contract time has been affected by such a change. In a few words, it is elastic where it needs to be.

Definite Instruction Sheet

The main element in this system is the *instruction sheet.* This sheet is given to the man when he starts a new job. He finds on it all he needs to know in regard to the details of the job. As an illustration, if the job is to be done on a machine tool, he finds on it the nature (and, whenever possible, the number) of the machine, the nature of the jig or fixture to be used and the various tools required for the various operations to be performed. The job is dissected into its elements. If there is more than one cutting operation, each of these operations is treated by itself. Speeds and feeds are given and instructions are given as to how these feeds and speeds may be obtained. Time is set for each element of the handling operations, such as chucking, unloading and setting of tools.

As it is not possible to avoid slight differences in the cutting capacity of various tools of the same shape and material, or slight differences in the machineability of different lots of work, a certain percentage is added to the cutting time. A further percentage is added to the total time for other reasons that will be mentioned later. In addition to all this, there is a certain amount of time given for the set-up of the machine. In this way, the total time allowed for a lot of pieces becomes the set-up time plus the time allowed per piece multiplied by the number of pieces in the lot.

The time allowed per piece is called the *standard time.* It is assumed that the man can make this time if he follows the instructions given on the sheet. However, the man is not compelled to follow the method indicated. He is free to do the work in any way he thinks best. His wages are increased by a given percentage if he succeeds in making the standard time. Experience has proved that this should be about 33 per cent.

Notwithstanding that the time is supposed to have been carefully analyzed, it happens now and then that the man finds a better method and cuts the time to a considerable extent. If this happens, then there would be the temptation to change the instruction sheet according to the new method. This should not be done. Rather, I say that the sheet should be changed, but that it should not be given out so long as the inventor of the new method is willing to take the job at the old figure. If he leaves or is promoted, the new method becomes the standard one, but the inventor has reaped the reward of his invention so long as he cared to do the job. Though the man is free to follow his own way, he has no right to complain if he cannot make the time when he has not followed the instruction sheet.

Certain safety measures should be taken to make the system work to the best advantage of employer and employee. There is always a possibility that the time has been set too low, so that it is not possible for the man to make his bonus, however hard he may try. The necessary machinery must be provided to correct such mistakes and do it in such a way that the man shall not suffer by the errors of the time setter. It is for that reason, mainly, that a percentage must be added to the total of cutting and handling time.

When Sheet Is Corrected

The man is supposed to report to the foreman or to some demonstrator, specially assigned to just such cases, if he feels that it will not be possible to make standard time. If this foreman or demonstrator cannot do the job in, say fifteen per cent less than the standard time, the sheet must be corrected. The man should be given credit for all the time lost, with the addition of the bonus for that amount of time, for the system assumes that the man would make this bonus all the time if he is capable and attends to his job.

Generally speaking, standard time cannot be made unless tools and machines are in proper condition, and unless the material to be worked on is as it is supposed to be. A slipping belt, or feed clutch, or hard castings would spoil the game. It would do that whether the task and bonus plan or any other plan prevails. If, under the new plan, he is told by his instruction sheet that his cutting speed should be 70 ft. and he finds that 50 ft. is the best he can do, he has proper cause to report the condition.

Once the bad condition is reported, it is possible for the management to do whatever is necessary to get better castings in the future, and if that is not possible, to correct the instruction sheet. Such corrective relations between man and management are automatically maintained because the management has taken upon itself the duty to show that the time can be made, and even can be reduced.

One of the first things one discovers when the task and bonus plan is introduced is that the condition of the shop is not so good as it was thought to be. The reason why this should be so is not far to seek. In the past it was the management alone that took care of the plant. Under the task and bonus plan both management and men have a part in the work of keeping the plant up to date and in correcting any conditions that are not what they should be.

Every Man an Inspector

Every man who has an instruction sheet before him becomes an inspector. To have reported small deficiencies in the past would have been kicking. He is not kicking at all, but merely looking after his own interests when he reports that he cannot carry out the instructions given him. The result of this continuous inspection by a great number of inspectors is that in a very short time the shop is in better condition than it ever was before.

It might be thought that there must be a large increase in broken tools and spoiled work, but the reverse is true. Experience has shown that both are materially reduced. He is careful not to do anything that may spoil his chance to earn the bonus.

Men and management are brought together as buyer and seller; or it might be said that the two enter into a definite contract. The acceptance of the contract is not compulsory on the part of the man. He has his day-wage if he prefers this. Nor is it compulsory on the part of the management. It can let the man go along on day rates. However, once the management gives, and the man accepts the instruction sheet, there is a mutual contract to which both parties are bound. The management must pay the bonus if the standard time is made; the man has no cause for complaint when he does not receive the bonus, because he did not succeed in delivering the goods.

Strip steel is gaged as it passes across the transfer table from the runout table rollers to the hot mill finishing department; a special truss supports the heavy cranes that pass overhead on either side

Republic Opens Wide Strip Mill

Largest unit of its kind has a rated capacity of 70,000 gross tons per month and can deliver hot strip up to 2121 ft. per min.

REPUBLIC STEEL'S new 98-in. strip mill, recently opened in Cleveland, is located on a 182 acre site, six miles from the mouth of the Cuyahoga River. The location of every machine and every item of equipment in the plant was scientifically worked out after months of intensive study, even though the massive machinery had to be spread out among 21 acres of buildings. Particular attention was paid to the fast growing trend throughout the steel industry of making "tailor made" products to order to meet the particular requirements and specifications of each customer.

There is always a continuous flow of production from unit to unit and from department to department without any back-tracking or lost motion. Slabs for the new strip mill come from Republic's nearby Corrigan, McKinney plant which has been enlarged and improved.

The hot mill can roll all finished widths from 30 to 94 in. and all finished thicknesses from 18 gage strip to ½-in. plate. Slabs, discharged from the furnaces at a temperature of about 2350 F. are brought to the hot mill over a heavy-duty delivery table 118 ft. long.

The three roughing and six finishing stands are identical 4-high mills, with work rolls 27 in. in diameter, 15 ft. 9 in. long overall,

Strip is pickled in two identical parallel lines by immersion in four sulphuric acid tanks and two water rinse tanks which remove all scale

and a 98-in. roll face. So accurately have the giant stands been built and so exactly have they been bedded into position that their pass line elevation varies less than 0.004 in.

Slab temperature is measured by rayo-tube type electrical temperature recorders located directly over the table in the hot mill. These instruments make a permanent continuous record of the temperature of each slab while it is being rolled at four different points in the hot mill: at the broadside mill, at the delay table, at the last finishing stand and at either the coiler, if strip is being rolled, or at the end piler, if plate is being rolled.

The batch pickler and scrubbing line for giving hot mill finished products a clean white surface is designed to handle sheets from 22 gage to $\frac{3}{8}$-in. in thickness, and from 60 to 168 in. in length. It consists of a pickling machine with three vats, an acid spray tank, water spray tank, scrubber and steam dryer. At the delivery end is a skin pass mill for black plate, a 4-high 17-roll leveler and a hand piler.

The pickling unit for cleaning coils which are to be further processed and treated in the cold mill, lines, each 505 ft. overall. Speed of consists of two identical parallel the lines is between 40 and 160 ft. per min. Temperature of the pickling tanks, maintained at about 185 F. is controlled by ten pyrometers, five in each line.

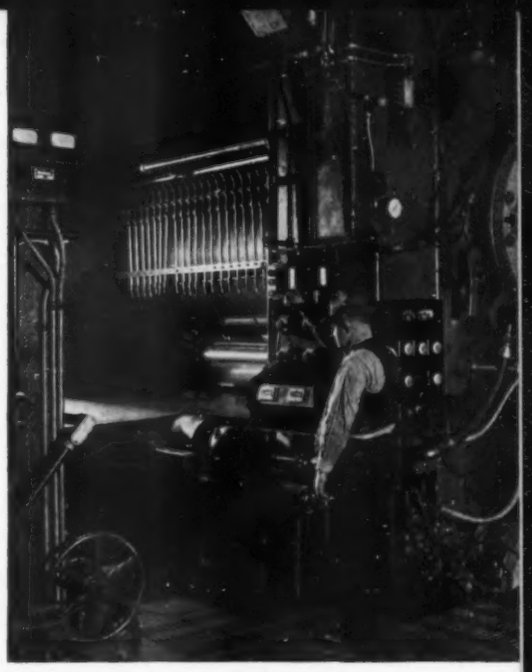
Coils and packs from the cold mill go to the annealing furnaces on sled runners by a special reversible conveyor, also used to return the annealed steel to the cold mill finishing department. To supply conditioned gas for preventing oxidation of steel in the annealing furnaces, there are three gas-cracking units, each having a capacity of 15,000 cu. ft. per hr. Natural gas is the primary fuel and the deoxidizer will produce approximately 7 cu. ft. of deoxidized gas for each foot of natural gas.

The oil lubrication system in the hot mill consists of three individual oil circulating systems, one for the reduction gears, one for the pinions and the third for the back up roll bearings. In the cold mill there are two circulating oil systems, one for the pinions and gears, the other for the back up roll bearings. The oil in the reduction gear and pinion systems have "extreme pressure" characteristics to prolong the life and increase the load carrying ability of the gears and bearings.

Throughout the mill there are more than 12,000 bearings and other points of friction which must be greased. Systems shoot grease from seven centralized greasing stations through a maze of small diameter pipes that climb over the machinery into 4,000 different bearings. One station on the hot mill and one on the cold mill work entirely automatically, a grease pump being set into action by time-clock arrangement every 30 min. In the case of the other stations, pressing of a button forces grease into the entire system. Central lubrication systems are equipped with indicators and alarms to insure positive lubrication at all times.

Welding is used extensively in machinery and equipment throughout the plant. Foot brakes, cranes, railings, scrap boxes, equalizer hooks, brackets and so on are all of welded construction. Main water pipes, hydraulic pipe lines and oil piping are also welded.

The steam line which brings steam from the power plant at Republic's blast furnaces on the west bank of the river and from the blooming mill boiler house at the Corrigan-McKinney plant is said to be the largest single electrically welded pipe installation in the country. The hydro-pneumatic accumulator in the hydraulic hot mill scale-remover system is an all-welded tank of unusual design. Plates are perfect sheets of steel carefully inspected by X-ray, and all welds are X-rayed for possible defects.

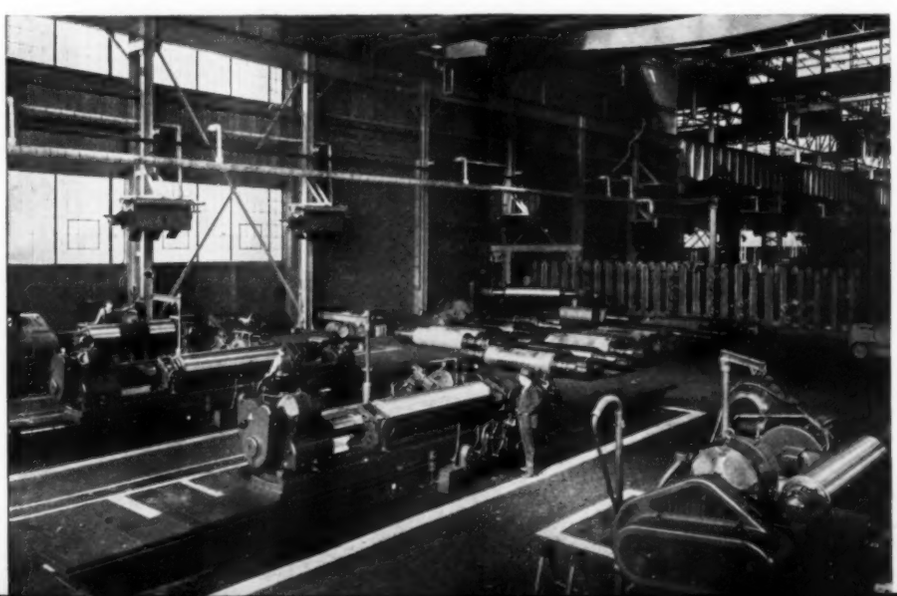


Rolls in the cold reduction mill are kept cool by water circulated internally to keep the process a dry one

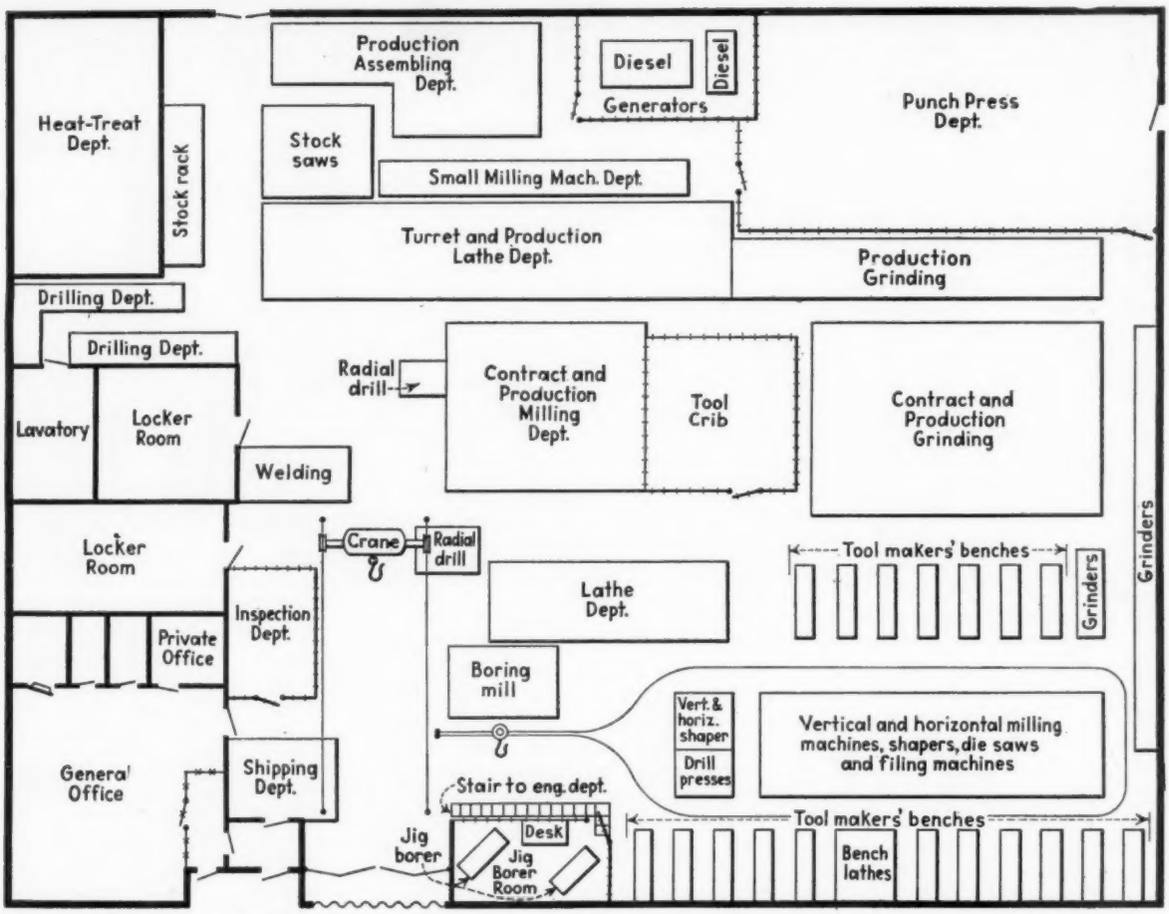
Particular attention has been paid to the protection and welfare of the men. Every modern safety device has been built into the equipment to keep accidents at a minimum.

All electrical equipment throughout the plant can be locked out on switchboards so that a repair man can go about his work in and around machinery safely. No one can accidently start up the machine a workman is repairing because he carries the safety-lock keys in his pocket. Approaches to all cranes are stairways equipped with hand rails. There are no ladders. Walk-ways are provided to carry men clear of all operations. All moving parts such as motors, couplings, shafts and screwdown drives are inclosed.

Proper ventilation, lighting and heating secure comfortable working conditions in all buildings. Inspection tables are built to the proper height and are well lighted. The welfare building, a two-story structure 46 x 216 ft., provides dressing room and shower room accommodations and an individual locker for every man.



Rolls are kept smooth, straight and in balance by means of four refinishing machines located in a shop at the head of the cold-mill building



The shop has been laid out for four kinds of work; tool and die, production, contract and special low-cost punch press work

A Job Shop That Is on the Job

Balance sheets are kept in the black by replacement of equipment, high wages to first-grade mechanics and efficient shop layout

HARRY BOYAR
Superintendent, Boyar-Schultz Corporation

A JOBBING SHOP is usually in the position of competing with its customer, and the more efficient the customer the greater the competition. The contract shop must do the work more quickly and cheaply than the manufacturer can do it and with satisfactory quality. Otherwise, manufacturer will set up his own department to do the job. Price becomes secondary when a high-quality product can be delivered in a reasonable amount of time.

Beginning business at the crest of the wave in 1929, we successfully survived the lean years primarily because we followed certain practices which are not new but may bear repeating.

First of all, we are firm believers in replacing machine tools as soon as others with better performance are available. Delivery is speeded up and quality improved by using the fastest and best tools on the market. For example, two jig borers less than two years old were replaced by new ones because of their superior performance over the previous model. Labor cost on individual parts is cheaper and the 10 to 20 per cent increase in produc-

Good lighting prevails throughout the tool and die division. Hoists on overhead track carry finished dies to the test presses in the rear

tion alone will pay for the machine in two years. Right now over 60 per cent of our machines are less than two years old. The remainder may be up to five years old because they are of the type which is pretty well standardized.

This modernization program is made easy in that we take a minimum loss on our traded-in machines because good care is taken of them. Strict rules have been established so that all men keep the machines spotlessly clean. We found that telling them occasionally wasn't enough, so we made etched brass plates which read, "If you are too good to clean this machine, you are too good to work here." These were attached to each machine where they can not be overlooked and are effective. So that any grit and particles will have a chance to settle out of the air before reaching other machinery and motors, the grinders are grouped at one side of the shop.

Quick delivery is often demanded on work which normally would require a week's time. To satisfy this demand two shifts have been kept on throughout the company's history. In slack times the night shift was small but it enabled us to give quick deliveries then, and served as a nucleus for expansion when business improved. Furthermore, the two-shift system makes possible a rapid expansion to a three-shift, 24-hr. day when the factor which sells the job is delivery on short notice.

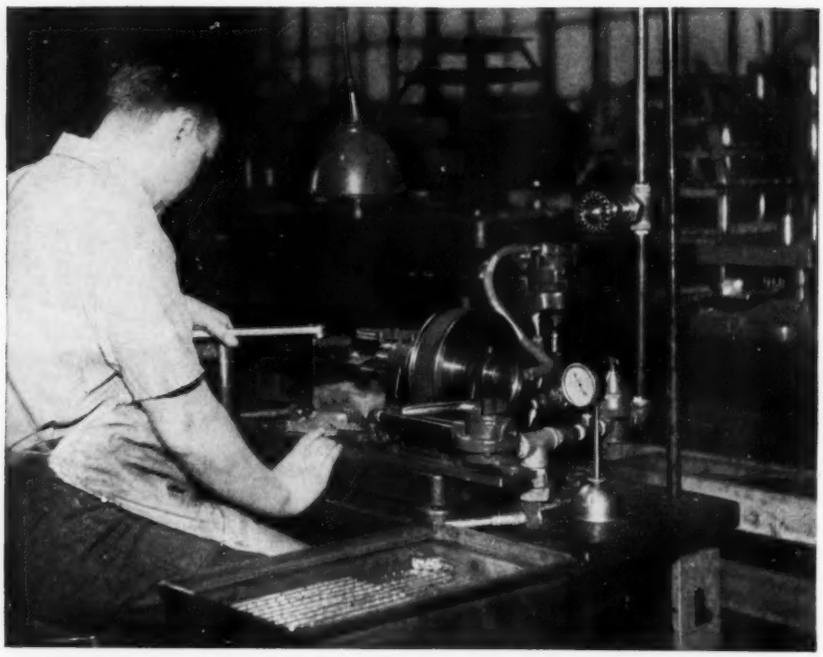
Delays due to ordering and getting materials are not a last-minute complicating factor. All kinds of tools are kept on hand in sizable quantities. Large supplies of a wide variety of steels are always maintained in spite of the nearness of suppliers.

From the standpoint of making a quality product, it has been found profitable in the long run to pay top wages. This policy insures getting the best mechanics and also serves to stabilize labor turnover. The extra cost is chiefly absorbed by the better quality of finished work and less reworking to meet final inspection requirements. Better workmen also waste less time on a job. The employment of high-grade men probably eliminates supervisory, inspection and other management expenses which can not be calculated.

The value of each man and the cost of each job are checked by a simple card system. Two cards are issued to the shop for each job. One card is kept by the foreman; the other stays with the job and the workman enters his time on it each day. He also turns a ticket in to the foreman giving the job number and the hours spent on it. The foreman records the hours on his card. If too much time is being consumed the foreman checks immediately. Here, again, the employment of quality labor pays dividends because no conscientious man will accumulate hours which he knows should not be necessary. His own entries of the time consumed on a job will reduce waste and speed up the work.

The office also keeps a spoilage card for each man. This card shows date, amount and cost of all work spoiled. Ratings are given periodically according to this record. Raises and lay-offs are based on these ratings.

When a job shop makes everything from bobbins for industrial sewing machines to printing presses, tools and dies in a space of less than



Manufacture of copper laps is one of the jobs that comes under the production division

30,000 sq. ft., some maneuvering is required to get the desired rapid production. Departmentalization involved a tool-and-die division, a production division, a special manufacturing division and a punch press division. In these divisions machine groupings were finally settled upon as the best means of saving space and expediting work. These are not theoretical divisions for purposes of management but mean a definite shop arrangement. While not separated by walls each division has a definite shop location.

Located for Light

Tools and dies are made at one end of the shop. This division is located for best day-around lighting. Machine tools are at the center of a double row of work benches. All machine tools are grouped according to type: bench lathes, milling machines, drills and so on. One branch of the overhead handling system runs along the aisle between the benches and machines. It has sufficient capacity to handle dies weighing up to 10 tons.

The same arrangement is repeated in the production department and in the special manufacturing division. It might be well to explain that the production division corresponds to a regular jobbing machine shop in which are handled miscellaneous jobs while the special manufacturing division handles mass production work such as the contract for thousands of sewing machine bobbins just completed.

The punch press department is separate from any of the other production groups. It is used for quick delivery jobs. Presses turn out work cheaply by using inexpensive dies by a method similar to that used in other shops.

An inspection crib has been placed next to the shipping floor. We have found that a complete assortment of equipment for inspection pays for itself. Hardness and dimension tests are performed here. Etching tests for grain and cracks are an essential part of this work. A large percentage of inspection is done in this crib with very little being done in the shop proper.

After trying several locations we found that best results were obtained with the J. & L. comparator and the Zeiss instruments by placing them in a separate room. We built a dustproof darkroom at one end of the shop near the grinding department. Walls are painted a dark gray which we felt would be less depressing than a black finish, especially if an inspector had to work in such surroundings for several hours at a stretch.

Heat-treating facilities are located on a balcony floor out of the way of machine shop activities. Parts are hardened or otherwise heat-treated in four types of furnaces: artificial atmosphere (Vapocarb), liquid bath using salts of various kinds, semi-muffle type electric and carburizing. Tools and dies are treated in the Vapocarb furnace. Drawing is done in a Lindberg Cyclone furnace.

The place of heat-treating in our shop and reason for placing contour instruments near grinding department are illustrated by the following procedure for making a tool:

1. Finish machined in the tool-and-die division with sufficient plus tolerance for a final grinding operation
2. Hardened and tempered
3. Tested for hardness in the inspection crib
4. Finish ground in the grinding department
5. Checked on J. & L. comparator for form and outline
6. Redrawn in Holden Hi-Speed-case

The last step has been found very desirable as it gives tools a marked increase in resistance to abrasion and useful life for a low added cost.

Executives Next to Shop

It is essential in a group the size of ours that contact between department heads and shop men be easy. It is just another factor that reduces elapsed time in completing a job. For that reason the president, the shop superintendent, the sales manager and the chief engineer are not hidden in offices. All occupy space in a common office next door to the shop. The designers on the second floor above the shop have direct access to the tool-and-die division which eliminates more waste motion. This arrangement makes for pleasant relations throughout the company.

Mobile Maintenance—**Belt repair is handled at the National Cash Register plant by means of a special truck used by the millwright department. The repair truck is one of several types, designed and built by this concern for special service. Other designs are used by stock tracers, the Tool Supplies department and departmental mail, including plant parcel post**

TALKING SHOP

Color Code

A manufacturer with a flair for experimentation painted three identical hand milling machines each a different color—red, orange and standard machine tool gray respectively. The orange machine is the most popular, particularly on the

night shift, with the red machine second and the gray a poor third. The chief attraction seems to be the cheery appearance of the orange miller—like sitting in front of a fire on a cold night. The shop owner doesn't know what it proves except that anything which makes the job more cheerful seems like a move in the right direction.

Embarrassing Chips

Along the railroad siding of a big metal-working plant not far from the Mississippi River are two mounds that look something like large, long hay stacks. But they would not appeal even to starving dust-bowl cattle for they are metal chips. One mound is made up of monel metal chips, the other of Xalloy chips. Neither kind of chip has been baled successfully at this plant and nobody has as yet found a way to salvage them. So there they sit, an embarrassment to the plant where they were produced, and a challenge to somebody to find a use for them.

Totin' Stuff Back and Forth

"I see the railroads are kickin' 'cause they ain't got enuf business," said the old man by the depot. "Ef they quit totin' stuff that never ought to be carried nohow, they sure would be in a mess." Which reminds us of two recent visits to shops at widely separated points. One, out in Ohio, was getting castings from New York State. The other, in New York State, was getting castings in Ohio. And they were not light castings by any means; some of them ran up to nearly 100 tons each.

It isn't easy to see why both of these concerns could not use foundries in their own state—not because of any state pride or desire to be self sufficient, but to save freight charges. For 100-ton castings are heavy things to "tote" even at a low freight rate.

Geared for Life

We become acquainted with gear teeth before we cut our own first set and continue the association after our chewing equipment has lost its usefulness. A prominent gear manufacturer recently received two or-

ders in the same mail. The first was for gears to adjust an obstetrical table; the second for gears to lower a casket into the grave. All of which indicates that gear applications overlap the "cradle-to-grave" span.

Research or Experiment

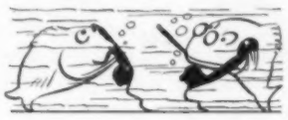
Just when the search after better methods is "research" and when it is "experiment" may easily lead to the splitting of hairs over words. But whichever it is, there are few operations, no matter how simple they seem, that cannot be improved by a careful study. A case in point is the prosaic operation of tumbling to remove burs.

Burring is a mean job at best, when done by file or other method that requires handling each piece individually. Tumbling is apt to bend the pieces, if they are at all delicate. They also get tangled in ways that sometimes defy separation without bending.

One concern devoted a lot of time to studying the sizes of the tumbling barrel, the angle at which it rotates, the speed and the material used. This resulted in the use of rubber lined barrels run at slow speeds and a mixture of sand, sawdust and water that varies with the work. The results are remarkably satisfactory and have repaid the time spent many times over.

An Industrial Fish Story

Mr. Fish of the American Steel & Wire Company of Worcester, Mass., recently called Mr. Pike of the Han-



son-VanWinkle-Munning Company, Matawan, New Jersey, who called Mr. Herring of the Hanson-VanWinkle-Munning Company of Pittsburgh, Pa., who called Mr. Trout of the Bethlehem Steel Company, Johnston, Pa., in order to make an appointment between Mr. Fish and Mr. Trout.

The appointment was made, but who caught what and how big it was, nobody will ever find out!

Special Machines

A recent visit to a broach manufacturer impressed on us once more the important part that ingenuity plays in the metal-working industry. This industry is so small that it has never paid anyone to design and build machines for it. As a consequence each company has devised its own special equipment. Standard lathes and small planers are used by this particular manufacturer for the work holding elements of this equipment. Self-contained, motor-driven grinders mounted on toolpost or cross rail constitute the cutting elements. As in other similar industries the man with the ingenuity to devise special machines for his own work has survived. *The Editors.*

Modern Finishes Save Metals and Minutes

Progress in the metal finishing field continues—the past year saw the development of new finishes and finishing process of interest to metal workers

DR. GUSTAVE KLINKENSTEIN
Vice-President and Technical Director, Maas & Walstein Company

DEVELOPMENT OF finishes especially designed to speed-up production has been one of the most important lines of progress in the industrial finishing industry. Years ago, products which formerly took days or weeks to finish were being sent through the finishing department in a few hours. Now we are doing many such jobs in a matter of minutes.

Every minute saved in the finishing process means savings in labor, equipment, storage space and fuel. More rapid shipments, reduced inventories and fewer rejects due to defects caused by shop dust and dirt are additional advantages offered by more rapid finishing methods. Consequently, manufacturers of metal products are greatly interested in these new finishes, and makers of finishes are continually working for new and improved finishing materials.

Variety Available

In any discussion comparing new finishes with those formerly used, the question arises as to whether, in gaining speed, we lose in quality of finish. No other finishing method has reproduced the depth and beauty of a finish consisting of several hand-rubbed coatings of varnish or enamel. We can, however, closely approximate such finishes with modern finishes at a fraction of the cost. Furthermore, modern finishes are available in greater variety and are much more durable. The balance is in their favor.

To illustrate the progress being

Abstracted from an address presented before the Boston Branch, American Electro-Platers' Society, Annual Educational Session, February 26, 1938.

Photographs Courtesy of De Vilbiss Company

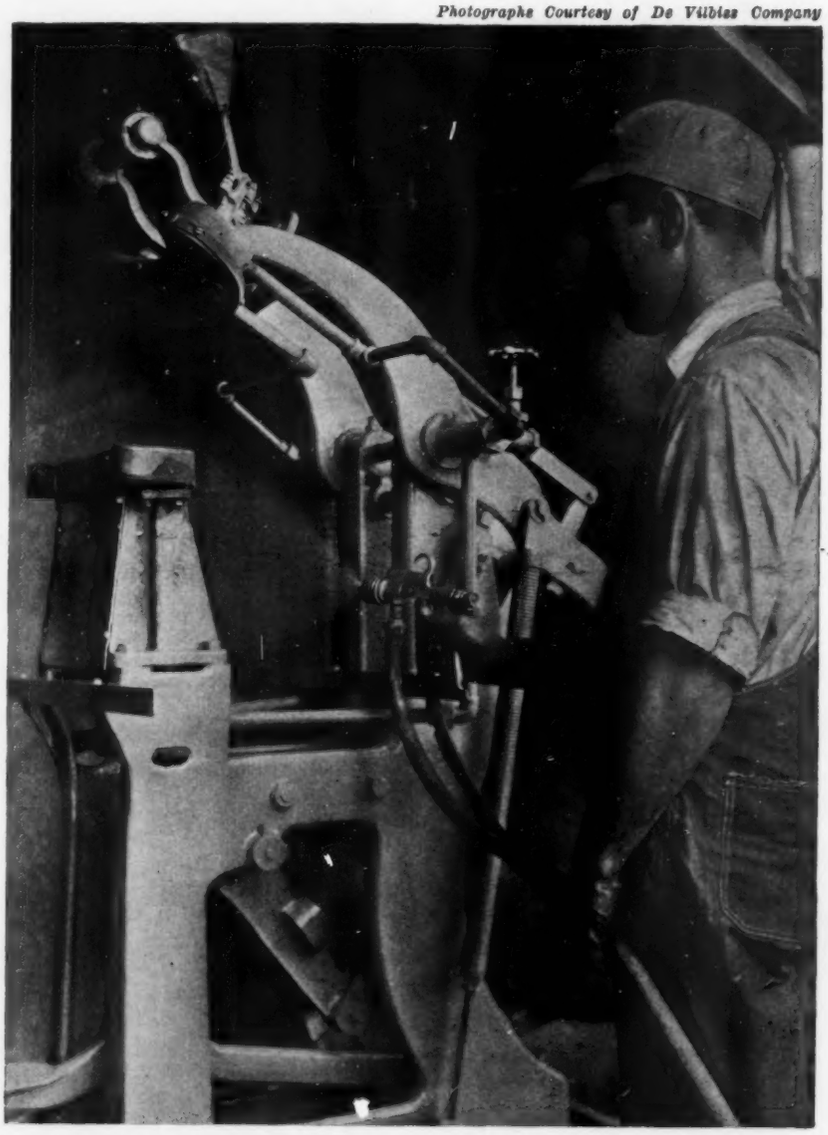


Fig. 1—In modern practice, all units can be finished in a standard neutral primer, or shop coat, designed to give the product necessary protection. A coat of lacquer-enamel of any desired color then can furnish the finish

made in the direction of more rapid finishing, let us consider the case of an oil burner for domestic use. These burners now are finished in pairs. The finisher sprays a coat of quick air-drying primer on the first of the pair, then repeats this operation on the second. By the time he has finished the second unit, the operator has the first ready for an air-drying coat of stipple, which is applied with a special gun that produces a rough stippled surface. Stipple then is sprayed on the second burner, after which both units are given a coat of air-drying lacquer enamel of any desired color. The entire operation requires 18 min., or 9 min. per unit, and the units dry hard, ready for further processing, within four hours without baking.

Some years ago this oil burner would have been a baked primer coat and one or two baked top coats. The whole job would have required at least two days. More recently, wrinkle enamel has been introduced for finishing products of this type. This finish can be sprayed directly on the bare casting and, as it wrinkles up in baking, it covers minor surface defects. Since it adheres well, it can be used without a primer. With a coat of lacquer-enamel or "metaluster" over the wrinkle, a durable finish is obtained that can be completed in about half a day.

The case cited is but an example of the now common practice of substituting air-drying finishes for baked finishes, whenever practicable, in order to save time and equipment. Since every improvement in durability and protective qualities of lacquer makes this substitution possible for new groups of products, users of baked finishes should check frequently to determine whether some new type of lacquer may reduce costs without sacrificing quality of product.

Quick-Drying Primer

Use of a quick-drying primer on the oil burner previously mentioned is an important factor. "Speed" primers of this type are so new that many manufactures are not aware of their time-saving possibilities. In many cases, continued use of primers that must dry for hours, or over night, before the next coat can be applied is unnecessary. "Speed" fillers also are proving satisfactory for many types of product.

Quick-baking enamels also appear on the list of new developments. Ordinary enamels regularly are baked for from one to two hours at 250 F., but these new enamels can be baked in from 10 to 30 min., using temperatures of about 300 F. Reducing baking time not only speeds up production but also increases the capacity of a given oven, thus reducing fuel costs. One such material is a white synthetic enamel, for steel and other metals, which covers well in one coat and, when baked, resembles porcelain enamel. It bakes rapidly, thus shortening the finishing schedule, and stays white during the baking. On aging, it is tough, hard and highly resistant to marring. This finish will withstand washing, and the action of grease, oils and household chemicals; it is finding many applications, especially for refrigerators and kitchen cabinets.

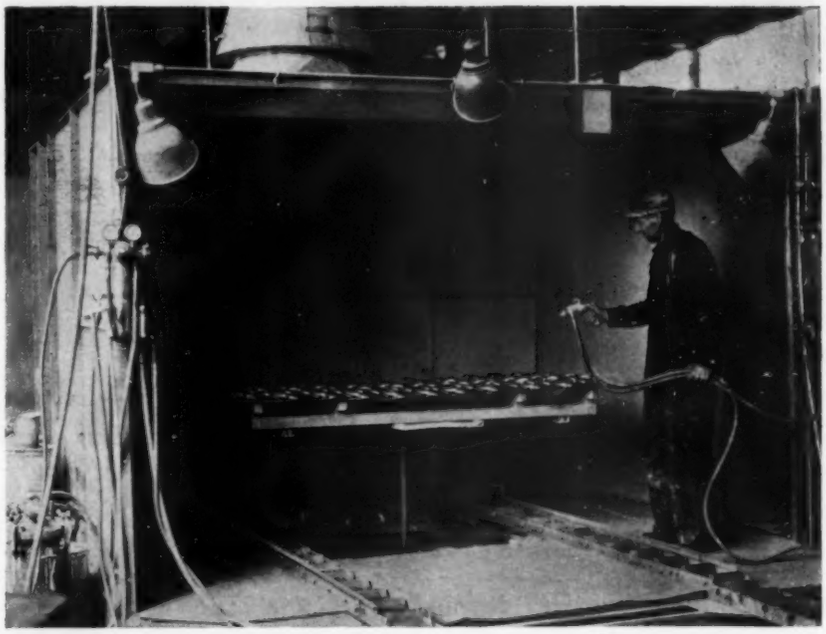


Fig. 2—Every minute saved in the finishing process means savings in labor, equipment and storage space. Modern finishes are available in great varieties and are more durable than those previously obtainable

Baking time also can be reduced by the multi-coat baking process. As an example, let us take a high-grade grained job. For this kind of work, many manufacturers first bake on a coat of oil base or synthetic primer, then apply the grain and bake that. Next, the top coats of clear lacquer are put on.

Instead of the synthetic primer, a "semi-synthetic" can be used. This type of finish contains a synthetic base and bakes to the durability of a straight synthetic; also, it air-dries hard quickly. Using this material, the schedule is as follows: (1) apply semi-synthetic primer, (2) air dry, (3) apply grain, (4) bake. Thus, the job is done in one baking operation instead of two. In some cases, two baking operations can be eliminated in this manner. Multi-coat systems of this type require careful control of the film thickness of each coat. If the films are too thick, they will not harden properly and the final finish will be defective.

Single Shop Coat

When a product is put out in any given color, it is common practice to use a primer of the same color. This custom is so established that many manufacturers, who offer a product in a variety of colors, use a different primer for each color. Since lacquer-enamels of good covering power are available, this complication is unnecessary. In modern practice, all units are finished in a single standard neutral primer, or shop coat, which is designed to give the product the requisite degree of protection. Then a coat of lacquer-enamel of any desired color, plus a top coat of clear lacquer if needed, supplies the final finish.

Besides selecting the speediest finish, the manufacturer also should select the most rapid method of applying the finish—whether by dipping, spraying, flowing, centrifuging or otherwise. There was a marked increase in the use of centrifugal coating machines during the past year, because of the rapidity with which they can coat many kinds of products.

In the color field, it may be noted that color is being used in greater variety for products of all kinds. Colors with a metal luster, produced by the addition of bronze powder, are especially popular at the present

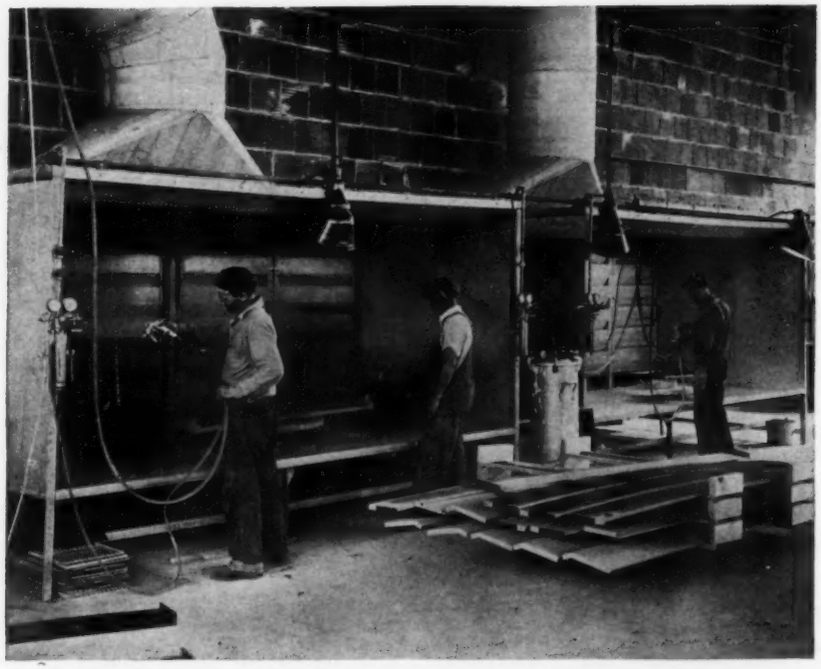


Fig. 3—A new white synthetic enamel for steel and other metals now widely used for finishing domestic refrigerators, covers well in one coat and, when baked, resembles porcelain enamel. It bakes rapidly and, on aging, is tough, hard, and resistant to marring

time. This applies, apparently, to everything from novelties to automobiles. Color-and-metal combinations are increasing in use. Aluminum and zinc recently have been added to the list of metals that can be used in this style because of the development of clear lacquers that protect their surfaces from tarnishing.

Colored Chromium

Polished chromium has to be colored by special methods, since lacquer-enamels do not adhere well to its surface. The methods employed include: (1) baking on a special primer which adheres well and forms a foundation for the lacquer-enamel; (2) lacquer the parts of the product to be colored before chrome plating with a lacquer that withstands the action of the plating bath and, then, plating the exposed metal areas.

Zinc possesses physical properties that make it thoroughly satisfactory for many purposes, but, until recently, its usefulness was restricted because of its unattractive appearance, even on indoor exposure. By the use of special lacquers, it now is possible to finish zinc die castings and stampings in any tone of copper, brass, or bronze and, in consequence, zinc is beginning to displace these more expensive metals in the manufacture of a variety of products. How far this particular development can go is not clear at present, but it may have far-reaching consequences.

It is impossible to discuss any phase of metal finishing without stressing the large number of highly special finishes that are supplied for this purpose. The subject has, in fact, become so complex that no one but a specialist in the metal-finishing field can select the most suitable finish for use under a given set of conditions. For this reason, users of industrial finishes should look to the maker for guidance in the selection of finishes. It is only through the closest cooperation that best results can be secured at the lowest cost per unit.

Among the new metal finishes offered during the past year are a line of clear and pigmented air-drying lacquers, capable of continuous exposure to temperatures up to 300 F. These lacquers are well adapted for use on electric lighting fixtures, cooking appliances, radiant heaters and signs. Another type of clear lacquer resists the heat of match flames and glowing cigarette tips, thus being useful for ash receivers, serving trays and similar articles. Ordinary lacquers cannot withstand temperatures much above 200 F. When subjected to such temperatures for any length of time, the lacquer film becomes brittle and peels off. Until recently, therefore, products subjected to high temperatures had to be finished in baked synthetics, baking japans or aluminum paint.

The addition of rust-inhibitors to the lubricating oil used in electric clocks, domestic refrigerators, and other motor-driven appliances designed to operate indefinitely without attention, created a new problem for the lacquer manufacturer. The compounds put into the oil to prevent steel parts from rusting discolor ordinary lacquer badly whenever they come into contact with it. This problem now has been solved by the development of a special clear lacquer which not only is resistant to the commonly used rust inhibitors, but also to salt spray, ten per cent hydrochloric acid solutions and outdoor exposure. This lacquer is well suited for use on name plates, as it is tough and flexible and withstands cutting and forming. Human perspiration is corrosive, and the problem of finding a good finish for flashlights, pencils, handles, hand rails and other products constantly handled is an old one. This problem also has been solved, since lacquers now are available that will last for months without failure on objects constantly handled.

An interesting finish was developed last year for the steel shafts of golf clubs. Since expensive golf clubs are objects of pride on the part of their owner, they must be attractively finished and must retain their good looks for years, in spite of the worst kind of punishment. An excellent finish can be secured by extruding a shell of celluloid over the steel shaft. This requires special equipment not usually found in a finishing room. However, a finish that is equally attractive and almost as durable can be obtained by applying four or five dipped coats of a special tough and flexible clear lacquer over a rolled-on grained ground coat. This finish also may find other applications.

Higher Solid Content

Lacquers of twenty years ago were low in solid content and produced thin films suitable only for protecting polished metal surfaces. Later, modern high-solid content lacquers were developed. As these new lacquers were suitable for a large number of different kinds of finishing operations, they quickly revolutionized the finishing industry. This development is still going on. Lacquers of still higher solid content appeared last year and give promise of finding many applications. They have a "build" that is much like synthetic enamel and they cost less to apply. Several other finishes recently developed for special purposes also might be mentioned. In general, there has been considerable progress in increasing the protective qualities of lacquers and enamels.

Fixture for Grinding Centered Flats

Opposite flats are ground central on six small shafts in this simple, self-centering fixture

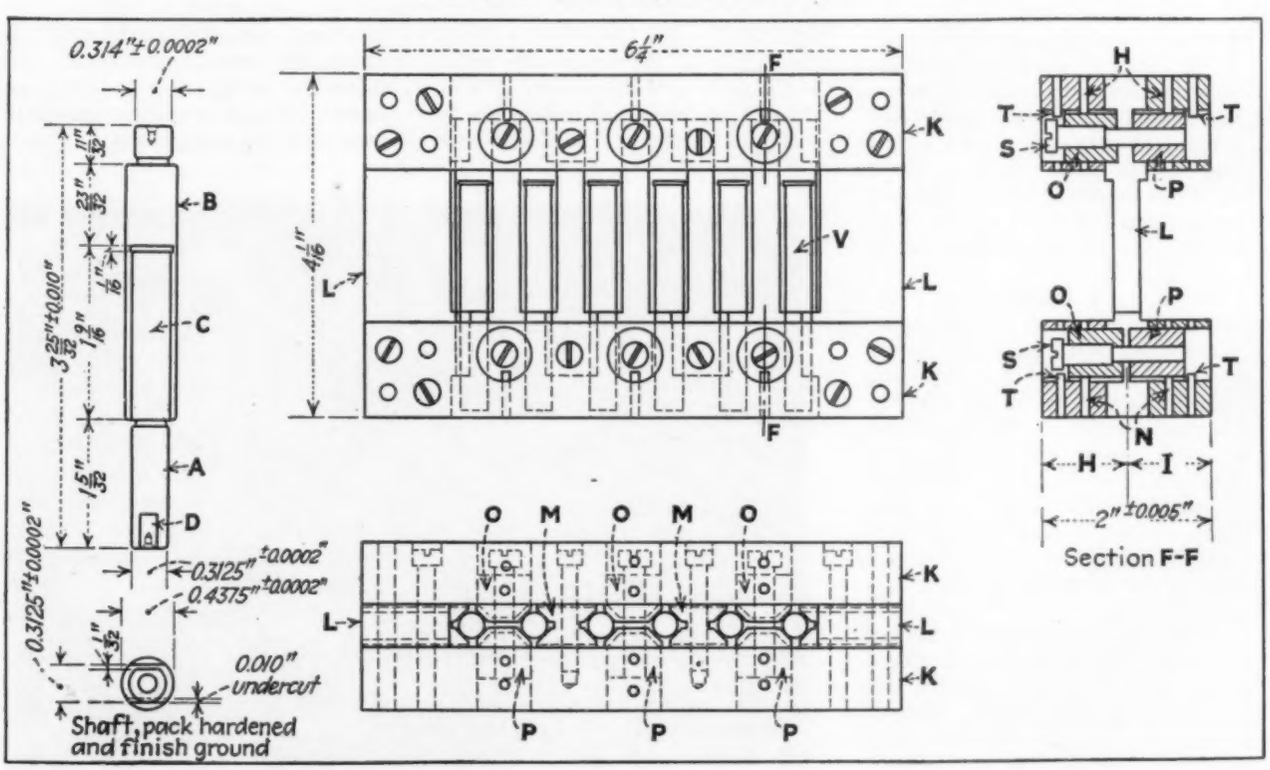
JOHN DOKULIL
Tool Engineer, International Projector Corporation

TWO FLATS, shown at C in Fig. 1, must be ground on opposite sides of a large quantity of pack hardened cold-rolled steel shafts in such a way that the flats are accurately centered with the cylindrical surfaces of the shafts. For this purpose, the grinding fixture, outlined in Fig. 2 and shown in use in Fig. 3, was developed.

This fixture is arranged to clamp the shaft on surfaces *A* and *B* between self-centering V's in such a way that the shaft will be centered accurately in the fixture even though there may be slight variations in the diameters of the clamped surfaces. Flat *D* is ground in a later operation. It will be noted, in Fig. 2, that dimensions *H* and *I* are made exactly equal so that when the pieces are finished the flats are central on the shaft.

In its essentials, the fixture consists of four tool-steel plates *K*, which are packed hardened and ground all over to close tolerances. These four plates are joined by spacer bars *L* and V-blocks *M* and are held together by machine screws and dowel pins. Necessary holes are drilled, reamed and bored with the fixture assembled. It then is disassembled and the parts are hardened and ground all over.

Fig. 1—Left. These cold rolled steel shafts are finish machined to the dimensions shown, except for the flats, before delivery to the surface grinder. Flats C are milled to 0.322 in. in order to decrease the amount of grinding required. The fixture shown in Fig. 2 clamps these shafts at *A* and *B* in such a manner as to hold the shafts central within the fixture. Fig. 2—Dimensions *H* and *I* must be exactly equal so that flats will be ground central on the six shafts that are held in each set up. V-clamps are self equalizing so that the shafts are centered against fixed V-blocks



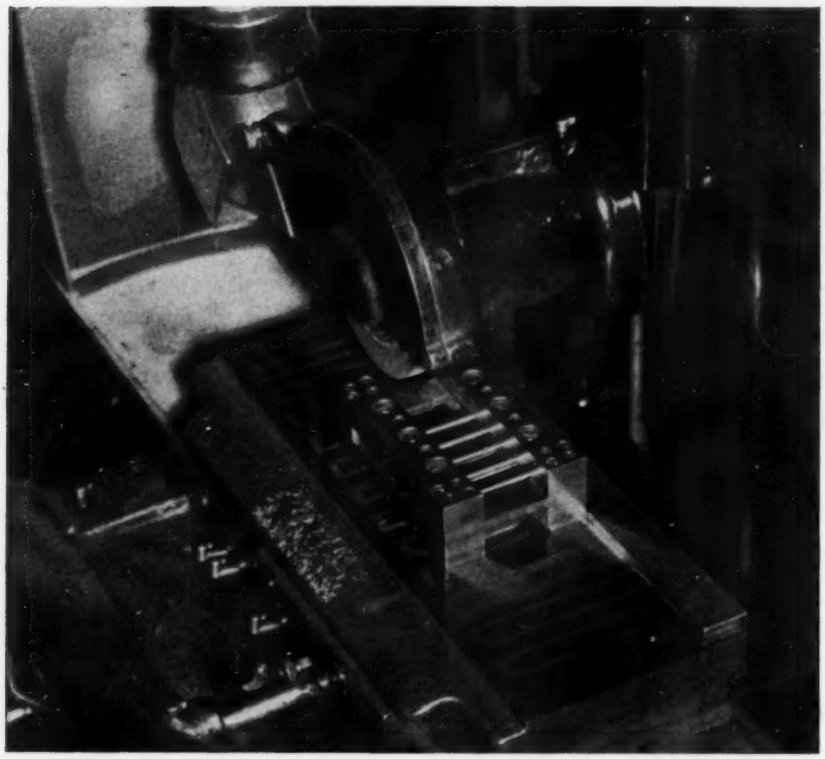


Fig. 3—Two surface grinders are used in conjunction with two grinding fixtures for this operation. One grinder is fitted with a coarse grain, rough grinding wheel for removing almost all of the grinding stock. Upon completion of the rough grinding operation, the fixture is transferred to the second grinder where a light finishing cut is taken with a fine-grain finishing wheel. Fixture is reversed on the magnetic chuck of each grinder

Oil-hardening steel is used for the spacers and V-blocks.

Self-centering clamps consist of lengths of cold-rolled steel rod having a keyway on one side to assemble with guide pins *N* and have opposite corners cut at a 45 deg. angle to form V's when drawn together. The upper clamp units *O* are tapped for left-hand threads while the lower clamp units, *P*, have right-hand threads. Special screws *S* have $\frac{1}{4}$-20 left-hand threads on the upper portion, while the lower portion has No. 10-24 right-hand threads. These screws also are made from cold-rolled steel and are case hardened. Stop pins *T* are placed above and below each set of clamp blocks to prevent the clamp assembly from falling through the bored holes in which they fit. Except for these stop pins and the guide pins *N*, the clamping assemblies are free to slide up and down in their holes.

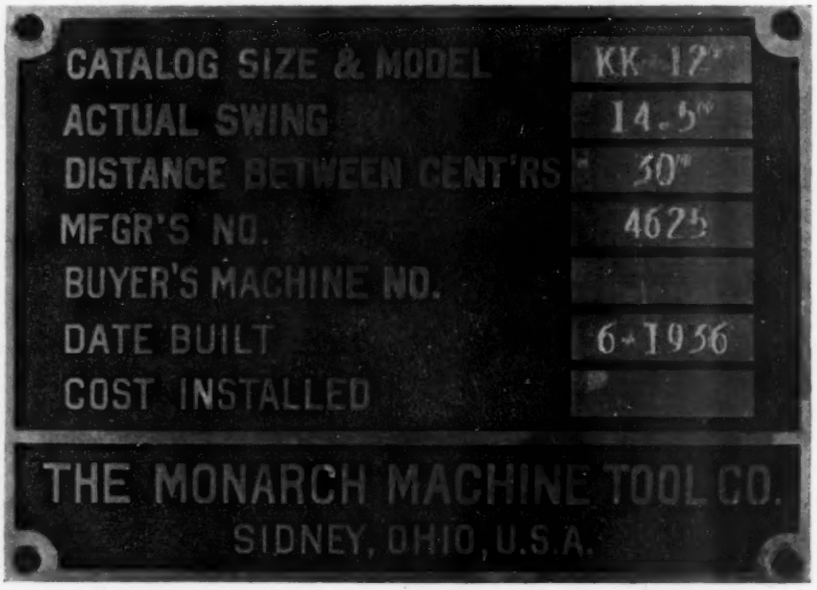
Six shafts *V* are mounted side by side in the fixture and each flat is ground by reversing the fixture on the magnetic chuck of the surface grinder. It is not necessary to move the shaft within the fixture until the grinding operation is completed. Two such fixtures are provided, in order that one may be loaded while the second is in use.

Inventory's Who's Who

THERE are many methods of keeping track of machine equipment inventory. Inventory numbers are frequently stencilled on the machine and seldom add to the appearance of the shop. Other shops use brass plates which are more sightly but usually less legible. But none of the usual methods give as much information as seems desirable.

The Monarch Machine Tool Company is using a name plate that can tell the whole of the machine's history if desired. As sent out it gives the maintenance department all information needed in listing the machine or in ordering parts. In addition it provides space for the shop number of the machine and for the price paid. Many managers believe that it is advisable to have the men know the value of the machines on which they work.

When filled out completely it gives the accounting department a record of the date of purchase and the cost for calculating depreciation. There is no hunting of old bills or check stubs, the date and cost are in plain sight at all times. Incidentally it will help back up the production man's requests for new machinery. A walk through the shop will enable him to show the man with the check book just how old each machine is. It makes the record a part of the machine and saves wear and tear on memory. It is a constant reminder to both men and management.



ROUND TABLE

Train in Vain

"I'm being picked on again," complained Ed as he met Al in front of the shop office.

"You ought to be used to it by now, Ed. Who's your latest cause of complaint?"

"Williams," declared Ed. "You know how he was when you were working in the big shop, always shifting things around and upsetting the departments 'for the good of the business as a whole.' Well, he hasn't changed a bit."

"Now that I look back," said Al, "he doesn't seem bad at all. So far as I can figure out, he was right in most cases. What's he been up to now."

"Well, Al, you know we've gone in pretty strong for this training business lately. Every foreman has to give a lot of time to apprentices and teach them the A.B.C's of the trade when they are routed through his department. I'm not kicking about that because they're good kids and for the most part will make pretty good mechanics."

"Then what are you griping about?" asked Al.

"I'm coming to that," said Ed. "After they're through the course they're assigned to a particular kind of work where they're supposed to stay for a while. Young Bill Green was put in my department about six months ago when he finished his training. I saw he was a bright youngster and spent lots of time showing him his way around. I broke him in on layout work, and he can transfer lines from a blueprint to a casting like an old timer. And now what—Williams wants to take him away."

"What for?" asked Al.

"Just because Sam Westcott who runs the milling machine department will need an assistant in about a year. Williams has his eye on young Green and figures that he's the man for the job. I'm the poor dud who taught him all the tricks just so some other foreman can get a prize assistant."

"Well who are you working for, Ed—your own department or the company itself. I can see why you're

upset, but even so, I should think you can see that your young layout man might be worth more some place else."

"He's worth a lot where he is, Al. That's what I tried to tell Williams. He's had six months on my work. Now just as soon as he's gotten the hang of it they want to shift him to another job. We've got other apprentices. Why not send one of them to Sam Westcott?"

"Because, as I see it, this boy is particularly promising and there's an assistant foremanship ahead for him. From your own interest in young Green, I should think you'd want to see him get ahead. He could lay out castings for you for the next twenty years and never get anywhere."

"I'm not kicking about young Green, Al, and I do want to see him get ahead. It's the system I'm against. I've spent a lot of time trying to build up my department along the best lines I know, and soon as I get it running right someone comes along and kicks the props from under it. It just doesn't seem fair."

Should a foreman be permitted to retain the good men he has trained in order to promote departmental efficiency? Or is it good practice to disregard departmental lines and shift men around where the management thinks they will be of value to the business?

DISCUSSION

Afternoon Pick-Up?

Most people will give added attention to their work after a slight pause for something to eat or a smoke in the morning again in the early afternoon. In my opinion, it pays well to have the so-called afternoon pick-up. I know of a shop where a number of machines have been installed to sell everything from candy and cookies to cigarettes.

Not long ago this plant was bothered with workmen selling candy to their fellows on a small scale. This, incidentally, is more time consuming than where the workman is permitted to go to a vending machine to make his purchase.

In the case in mind, vending machines were first installed and operated by an outside concern which realized a good profit. Later the company purchased these machines and the profit now goes to the Mutual Benefit Society, with the result that very little dues have been collected, even though substantial

benefits have been paid for illness and deaths. Everybody, including the management, is happy about the arrangement and the Mutual Benefit Society is prospering.

—J. C. P. BODE

Loyalty—An Asset

Loyalty is often absent because it is not appreciated. Even though a firm offer high wages and bonuses, if they have a bad reputation as to the treatment of employees they will not get the best men. To get loyal men they must reward loyalty among the machinists in the shop as well as the foremen and executives. Men should never be brought in from the outside to take good positions if men in the shop could be promoted.

—W. E. WARNER
London, England

Beginner's Luck

It is good business to start a new man on an easy assignment, at least until he gets his bearings in a strange shop. Ed made a mistake in giving a fussy job to a new man. He probably made matters worse by telling Barney that Reynolds was hounding him for the job.

Some men have the ability to start almost any sort of a job in strange surroundings without showing signs of nervousness. These men are, however, likely to have developed this ability while "floating" around from one shop to another. On the other hand, the "home guard" mechanic, who always has lived and worked in one town, and who will prove to be a steady dependable workman, may be more nervous in starting a new job.

—H. M. DARLING
Superintendent
Wells Tool Company

Better or Worse

Perfection in workmanship probably never will be attained because of the human element. This must be taken into account by a manufacturer, just as he considers the limitations of his machines. It is to his interest to obtain the best possible machines and the best workmen. However, mistakes are bound to happen and it is not fair to penalize a good workman for an occasional error.

Where piece work prices are employed a different situation exists; the workman is paid a certain amount for a good job. If he makes a mistake, it is only right that he should pay for it, since he is not filling his part of the bargain. In a machine shop paying an hourly wage for a man's best services, the manufacturer should absorb the cost of poor work or mistakes.

—ROGER C. DICKEY
The International Paper Box Machine Company

It may be fair to charge a workman for time spent on a job that is spoiled, but from actual experience I am convinced that it is not good management for the following reason: (1) It places a workman under an unnecessary strain, (2) The job may be spoiled by conditions over which the workman has no control, (3) It adds to the cost of manufacture by extra bookkeeping. (4) It tends to make a man cheat by disposing of the scrap when possible, (5) Very few workmen make scrap intentionally, (6) It develops a negative attitude on the part of the man.

It is better to spend time and money keeping tools and machinery in condition and in training the workmen to take pride in a well finished job than to let a man go ahead on a job and make scrap, then using the "bawl-out" system after the job has been scrapped. The practice of charging scrapped jobs back to the workmen does not reduce the scrap since it does not remove the cause for making scrap. It is better to educate a workman on methods of producing good work and, if this fails, to transfer him to other work that does not require as much skill.—CHARLES F. STAPLES

Glorified Clerk?

Except in isolated cases, the clerk will not prove successful as a foreman; nor is he often transplanted in this way. Almost as exceptional is the foreman who excels in clerical work. When he is good on both counts, he certainly deserves a larger scope than most foremen are allowed. It is all to the good, however, when the foreman is able to manage his department satisfactorily and, on occasion, prepare clear and concise reports.

The ability of a foreman to write detailed reports is particularly advantageous where reports can be used as a guide for future procedure, or where they may serve as a warning against a recurrence of errors. The recounting of detailed procedure can show what had to be done under certain conditions and outlining expedients adopted to cover unexpected contingencies will be of value should those contingencies recur.

The danger is that once the foreman is expected to prepare daily or periodical reports, these reports degenerate into a matter of red tape. A minimum of reports and forms to be entered can serve highly important and useful ends. In case these reports serve as a means to improve manufacturing methods they are justified, but when they serve as an end in themselves they are unpardonable. There are few bonds harder to break than those made of red tape. —W. R. NEEDHAM
Stychfields, Staffordshire, England

Rolling Stones

The average rolling stone machinist is a good sport, not likely to let you down in the middle of a rush job; nor is he a "mollycoddle," apt to be kept from work by a slight accident or ailment. He is glad to give a hand setting up a job and will loan his tools without crabbing.

I have known for a long time a typical rolling stone machinist who, since jumping his apprenticeship in the gay nineties, has worked from Maine to Montana and doesn't seem out of place, whether he is a radial drill operator or a shop superintendent. Once he quit a job as repair boss because he couldn't get a raise from twenty-seven to thirty dollars a week. However, it seems that he had been with this company long enough to acquire a reputation, because three months later he was back as supervisor of machine tools at forty-five dollars a week; he had worked in two Detroit shops in the meantime.

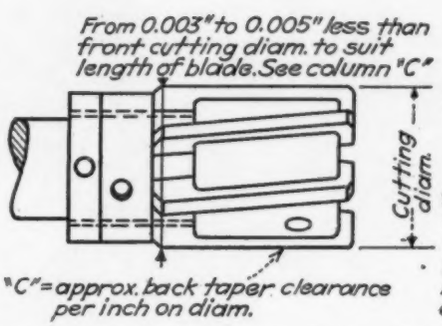
This company operated a gear shop, one of the first to work on the intensive machine production policy of "wear 'em out and buy new" in the pre-war days. So, with plenty of machine weaknesses to correct, he was in his element. About a year later, he left there and hired out to another company as all around machinist. He started with a job of fitting air chucks to a battery of large boring lathes. These lathes had spindles 42 in. long and he had to drill a $1\frac{3}{4}$-in. hole through the length of each spindle. I have a hunch that he made a big hit in machining these holes, since I worked for him a few months later when he was master mechanic of the same shop and was told that he had made the tools for the job right in the shop.

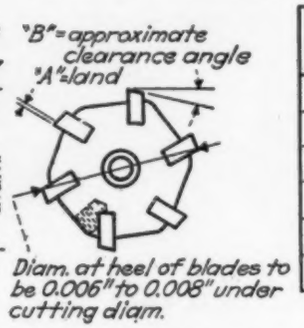
—BRYAN HAWLEY

AMERICAN MACHINIST *Reference Book Sheet*

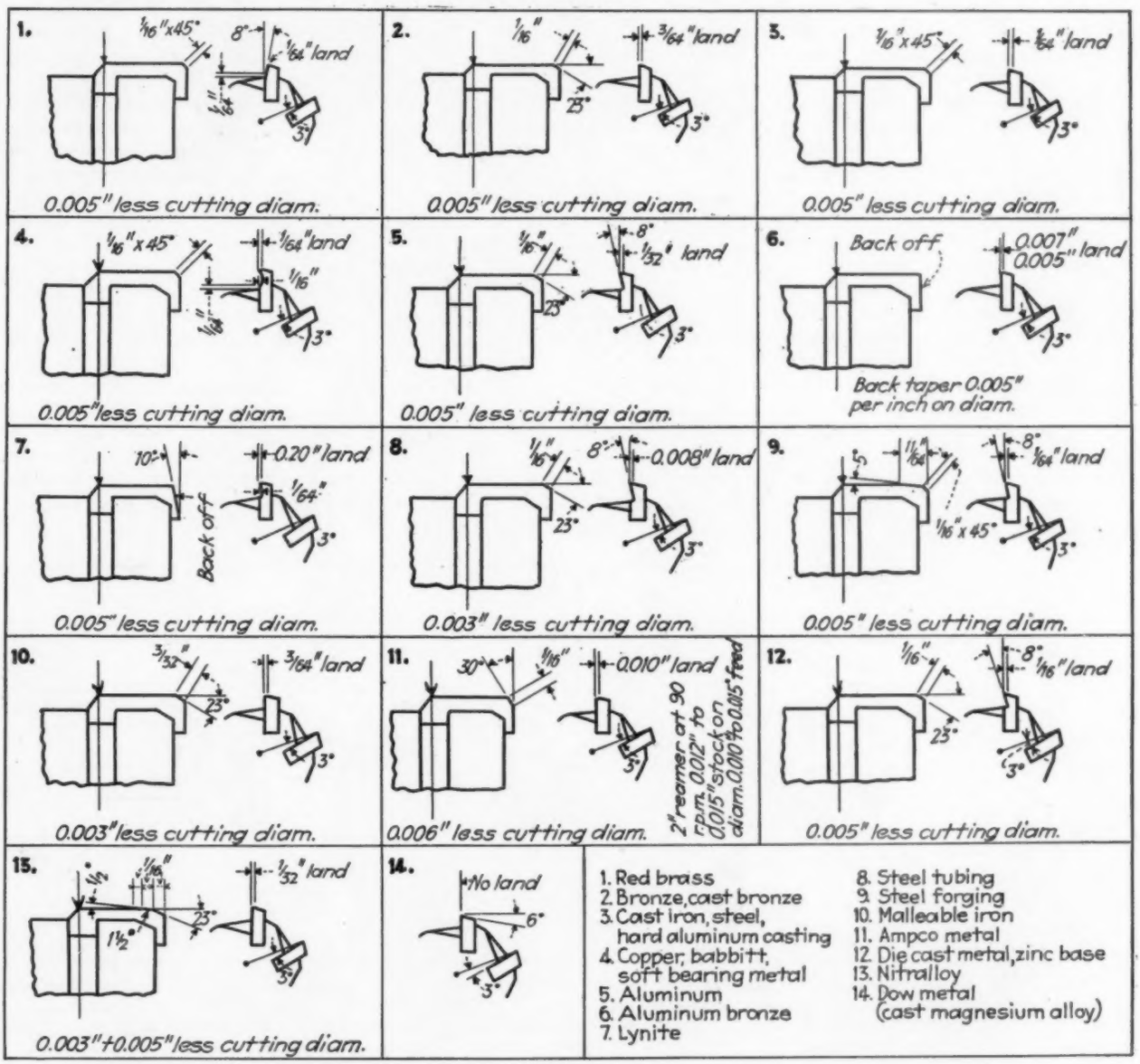
Reamer Grinds for Various Materials

Courtesy of the Wetmore Reamer Company


From 0.003" to 0.005" less than front cutting diam. to suit length of blade. See column "C"
Cutting diam.
"C" = approx. back taper clearance per inch on diam.



Reamer Size	A	B	"C" taper per inch clearance
1" to 1 11/16"	0.010"	10°	0.002"
1 3/4" to 2 1/16"	0.010"	10°	0.002"
2 1/8" to 2 1/2"	0.031"	10°	0.002"
2 9/16" to 3 1/16"	0.031"	10°	0.002"
3 1/2" to 4 1/2"	0.035"	8°	0.0016"
4 9/16" to 6"	0.035	8°	0.0018"


1. 1/16" x 45° 8° 1/64" land 1/64" 3°
0.005" less cutting diam.
2. 1/16" 3/64" land 25° 3°
0.005" less cutting diam.
3. 1/16" x 45° 1/64" land 3°
0.005" less cutting diam.
4. 1/16" x 45° 1/64" land 1/16" 1/64" 3°
0.005" less cutting diam.
5. 1/16" 8° 1/32" land 25° 3°
0.005" less cutting diam.
6. Back off 0.007" 0.005" land 3°
Back taper 0.005" per inch on diam.
7. 10° 0.20" land 1/64" Back off 3°
0.005" less cutting diam.
8. 1/16" 8° 0.008" land 23° 3°
0.003" less cutting diam.
9. 11/64" 8° 1/64" land 5° 1/16" x 45° 3°
0.005" less cutting diam.
10. 3/32" 3/64" land 25° 3°
0.003" less cutting diam.
11. 30° 1/16" 0.010" land 3°
2" reamer at 90 rpm. 0.012" to 0.015" stock on diam. 0.010" to 0.015" feed
0.006" less cutting diam.
12. 1/16" 8° 1/16" land 25° 3°
0.005" less cutting diam.
13. 1/2" 1/16" 1/32" land 25° 1 1/2" 3°
0.003" to 0.005" less cutting diam.
14. No land 6° 3°

1. Red brass
2. Bronze, cast bronze
3. Cast iron, steel, hard aluminum casting
4. Copper, babbitt, soft bearing metal
5. Aluminum
6. Aluminum bronze
7. Lynite
8. Steel tubing
9. Steel forging
10. Malleable iron
11. Ampco metal
12. Die cast metal, zinc base
13. Nitralloy
14. Dow metal (cast magnesium alloy)

IDEAS FROM PRACTICAL MEN

To Remove Slugs From Perforating Dies

G. A. GILBERTSON
Superintendent
Pines Winterfront Company

The method herein described of removing slugs from perforating dies has proved to be very successful, and as the set-up is inexpensive it should be of interest to those having such problems to solve in their own shops.

In the illustration is shown a perforating die. In the bottom of the die-shoe a groove has been milled the full length. The groove may be from $\frac{3}{8}$ to $\frac{3}{4}$ in. deep, depending upon the thickness of the stock perforated, and wide enough to provide clearance for the slugs. When the die is set in the press, the bolster becomes the fourth side of a rather tight inclosure.

A compressed air line is then run to the groove, the nozzle being so set that the air jet enters one end. For greatest economy it is desirable to place a valve in the air line so that it will be operated by the press ram to release the air on the up stroke and blow out the slugs. Removing slugs by this means obviates the necessity of drilling the bolster for the slugs to drop through, and also the necessity for relying upon the operator to mechanically remove the slugs, which if neglected would entail the expense of a slugged or broken die.

Once the press is equipped with the air line and the valve, it can be used for removing the slugs from any die by merely setting the air nozzle in the proper position. This method has proved successful with an air pressure of from 75 to 100 lb. on slugs up to $\frac{1}{8}$ in. thick.

Revolving Drill-Chuck Adapter

H. MOORE
Leeds, England

In drilling work on centers, every lathe operator knows the advantage of turning the drill occasionally to let the chips fall out of the flutes, and the adapter illustrated does that automatically.

The shank *A* is held in the tailstock spindle and is tapped for the feed screw *B* on the adapter *C* which is fitted with the handwheel *D* and holds the drill chuck. Since the drill is fed to the cut by turning the handwheel and revolves in unison with it, the flutes are continually changing their relative positions and the chips are permitted to fall out. If the operator's hand is temporarily removed from the handwheel no damage can occur, since the rotation of the lathe spindle will turn the drill backward and screw the feed screw into the shank, withdrawing the drill from the cut.

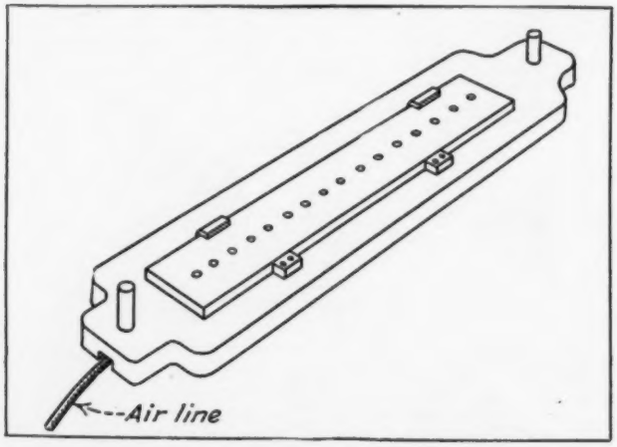
Press Tools for Curling Three Prongs

WILLIAM B. GREENER

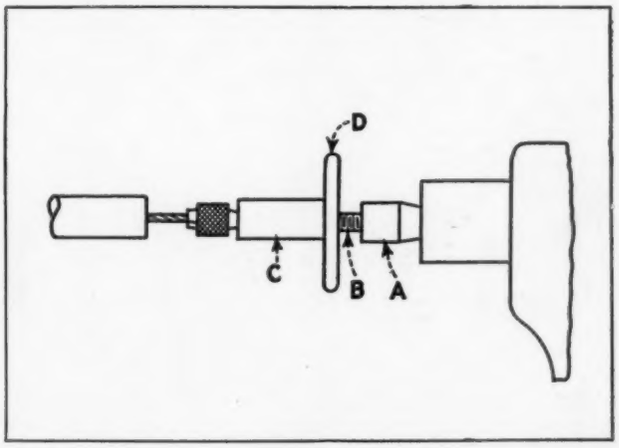
The tools illustrated were made for use in an arbor press of the conventional type for curling the three prongs *A*, *B* and *C* in the work *D*, the finished work being indicated in the tools by heavy dotted lines.

Plate *F* is mounted on springs at *H* and its amplitude of movement is limited by shoulder screws *I*. The plate is recessed in the center and is machined to form a nest for the work. Also, a hole of the same diameter as that in the work is drilled to fit the pilot *K* on the spring-actuated plunger *L* in the punch *M* which curls the prongs.

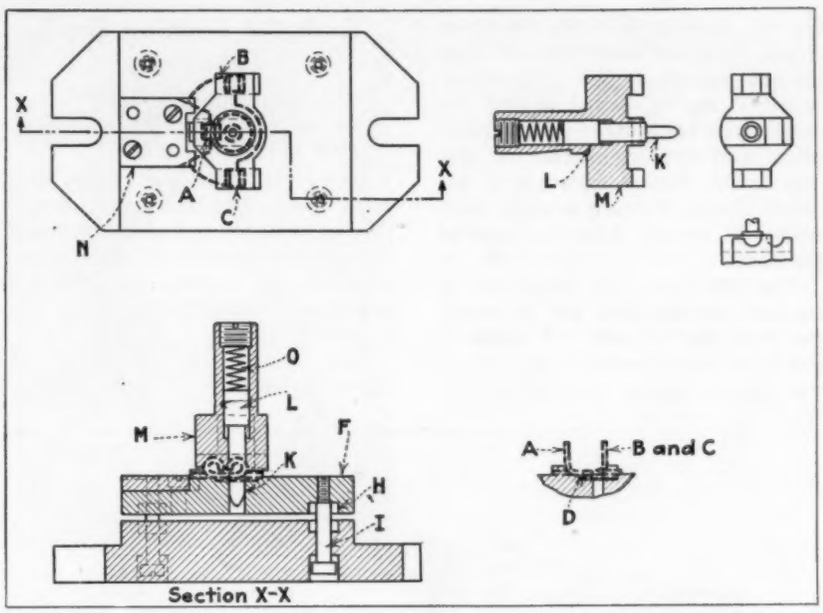
When the work is in the nest in plate *F*, it is prevented from turning during the curling operation by one of its wings engaging a slot in the locating plate *N*. When the ram is brought down, the pilot enters the hole in the work and the shoulder on the plunger holds it in the nest



Slugs are blown out by a jet of compressed air, the nozzle being entered in one end of a groove in the bottom of the die-shoe



Since the drill is revolved in feeding it to the cut, the flutes are continually changing their relative positions, permitting the chips to fall out



Work is held in a nest by the shoulder on the plunger, and is prevented from turning by one of its wings engaging a slot in a plate

as punch *M* curls the prongs. If the work should adhere to the curling punch as the ram ascends, it will be ejected by the spring *O* forcing the plunger downward.

Inside Micrometer

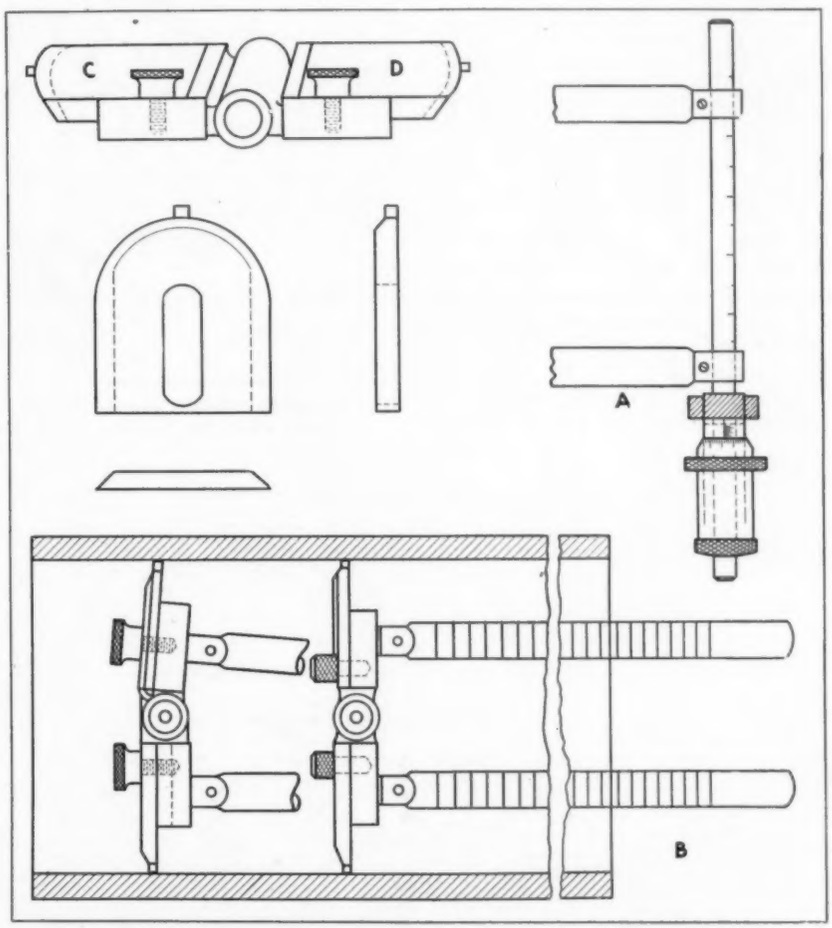
ARTHUR SILVESTER

Referring to the article under the above title by J. R. Whittles (*AM*—Vol. 81, page 857), I think the inside micrometer he describes for measuring the diameters of fairly large and deep holes would be very expensive to make and also heavy.

For measuring the diameters of deep holes, the method of holding the micrometer shown at *A* is often resorted to. Wooden handles are attached to the extension rod by brass clips. I have seen this device used by government inspectors for checking the diameters of large guns.

A gage used in Great Britain for checking diameters of tubes for guns is shown at *B*. The body of the gage is in two parts which are pivoted so that it can easily be entered in the bores. The parts are machined on both faces and are dovetailed to receive the blades *C* and *D*. Hardwood handles are attached to both parts of the body and are graduated to enable the inspector to note the depth at which any variation in diameter occurs. The gage is set by an outside micrometer and is put in the bore. If it is either tight or loose, it is taken out and adjusted, adjustment being repeated if necessary until a real sensitive feel is obtained. It is then taken out and measured by an outside micrometer.

The graduations on the handles are particularly useful in checking deep holes that are tight or loose in one or more spots, since their distances from the mouth of the hole can be told at a glance, and the hole can be lapped without danger of enlarging the parts that are correct in size. The graduations are also convenient when checking the diameter of a hole at each inch of its depth.



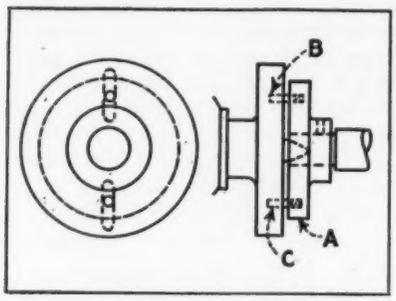
A method of handling an inside micrometer in deep holes. Also a gage for checking variations in inside diameters of holes at known depths from their mouths

Safety Lathe Dog

R. G. HEWITT
Huddersfield, Yorkshire, England

One of the most fruitful sources of accident to the lathe operator is the driving dog. He often forgets the danger from the projecting setscrew and the tail until he is forcibly reminded by having his hand knocked or his clothing caught by one of them.

The dog illustrated at *A* eliminates danger of such accidents, since the ends of the projecting studs *B* and *C* are covered by being engaged in slots in the faceplate and the setscrew is of the safety type. An additional advantage of having two driving studs is that the strain on the headstock center is equalized. The body of the



The two driving studs engage slots in the faceplate. Besides eliminating accidents to the operator, they equalize the strain on the headstock center

dog is cast iron and the bore is large enough to admit the largest work it is intended for. Reducing bushings are provided to cover work having a wide range of diameters. The bushings are drilled to permit the setscrew to pass through and grip the work.

Combined Depth and Thickness Gage

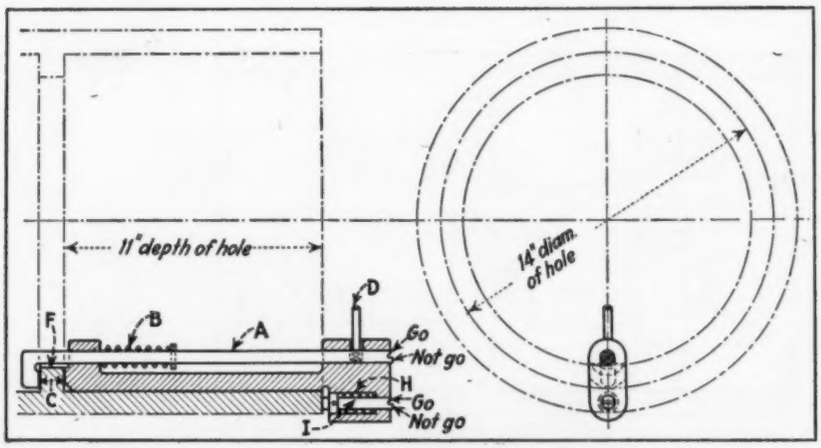
J. R. WHITTLES

In the illustration is shown a gage for checking the depth of a bored hole and the thickness of an inwardly projecting flange.

The body of the gage is made of aluminum for lightness and ease in handling. The indicating rod *A* is pushed outward by the spring *B* and has a step on its outer end to form a flush pin. Its inner end has an offset at *C*. Pin *D* is used as a handle to rotate the rod so that the offset will clear the flange *F* in the work when placing and removing the gage. The outer end of the gage is counterbored to receive the spring *H*, and rod *I* has a step to form a flush pin.

In use, the indicating rod *A* is rotated by pin *D* so that in entering the gage in the work the offset *C* will clear the flange *F*. It is then pressed inward against pressure of spring *B* and is rotated so that the flange will be gripped between the offset and the inner end of the gage when inward pressure is released. Spring *B* being stronger than spring *H* it will hold the gage in position.

The thickness of flange *F* is checked by the flush pin *A*, while the flush pin *I* checks the depth of the hole from the outer surface to the upper edge of the flange.



The gage has two flush pins, one for checking the thickness of an inner flange and the other for checking the depth of the hole

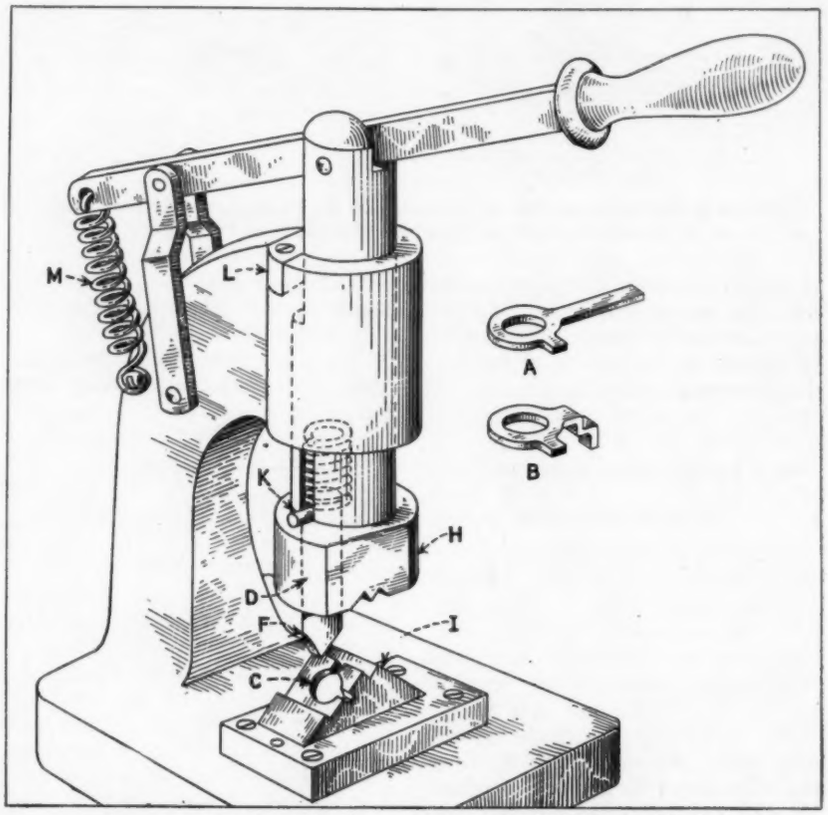
Tools for Forming Small, Thin Parts

CHARLES H. WILLEY
Superintendent of Manufacturing
Hoyt Electrical Instrument Works

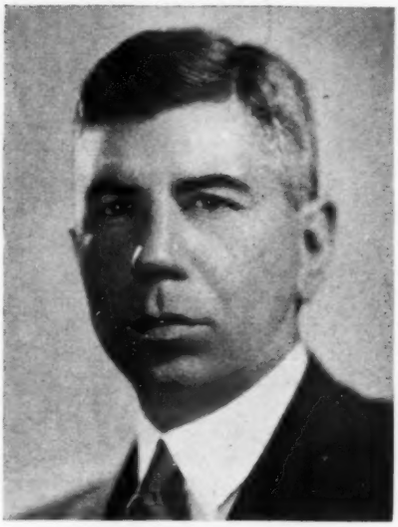
In making small parts from thin stock it is often better and cheaper to do the blanking and the forming in separate operations. Such parts were needed in small quantities for one type of our instruments that had a limited sale.

The blanks, one of which is shown enlarged at *A*, were made in a small automatic bench press and were formed to the shape shown at *B* in the hand-operated bench press illustrated, the blanks being nested at *C*. As the ram descends, the spring-actuated plunger *D*, having a V-shaped end *F*, contacts the blank and holds it in the nest. Continued downward movement of the ram causes the plunger to recede in the ram and permits punch *H* to make the double bend in the tongue.

The plunger is guided by the pin *K* engaging a slot in the side. A flat on the ram contacts the plate *L* and prevents it from turning. Pull spring *M* is attached to the operating lever back of the fulcrum and prevents it from dropping.



A spring-actuated plunger having a V-shaped end holds the blank in the nest while the forming punch makes the double bend in the tongue



CHARLES M. WHITE

Tom Girdler Opens 98-In. Republic Continuous Mill

CLEVELAND—Republic Steel Corp. formally opened its new 98-in. continuous strip sheet mill here on March 15 with a large group of newspaper and business paper editors present. The new plant (described on pages 226-227) has an annual capacity of 1,000,000 tons of hot- and cold-rolled strip and sheet, and is capable of rolling strip steel 94 in. wide.

"The planning and building of this mill," said Tom M. Girdler, chairman of Republic's board, "was predicated upon our estimates of the future markets for steel. It is my firm conviction that there is almost literally no limit to these future markets, especially markets for flat-rolled steel. Not a day passes but what steel is being adapted to some new use. Every lot of steel going through the continuous mill is a special lot. Strip steel these days is custom-built."

Mr. Girdler spoke at a dinner at the Union Club which ended the day's program. Charles M. White, vice-president in charge of operations, described some of the difficulties encountered in building the new mill, including the necessity for changing the course of the Cuyahoga River.

Speaking at a luncheon for the editors, R. J. Wysor, Republic's president, remarked that "obsolescence of the old-style mills all over the country affords another example of the recapitalization requirements of the steel business and should be a strong answer to those critics who think the industry makes too much profit."

Production Meeting to Discuss Yearly Wage

NEW YORK—This year's conference of the Production Division, American Management Association will be held at the Hotel William Penn, Pittsburgh, on April 20–21. The conference will emphasize two timely responsibilities of the production executive—"The Human Element in Production" and "Gearing Operations to Quick Changes in the Business Outlook." Specific papers under these heads will include "Getting Management's Viewpoint to Employees," "Methods of Sounding Out Employee Attitudes," "Foreman Training," "Developing Junior Executives," "Advance 'Danger Signals' and How to Act on Them," "How Specific Companies Prepare for Sudden Changes," and "Job Analysis and Rate Setting to Meet Today's Wage-Payment Problems."

An entire afternoon has been set aside for a discussion on wage payments, and will be devoted largely to the very important subject of payment by the year. Several speakers will present briefly the specific experiences of their own companies.

Railway Appliance Group Elects T. E. Rodman

CHICAGO—At its 27th annual exhibit in the International Amphitheatre, March 14–17, the National Railway Appliances Association elected the following officers: president—T. E. Rodman, Maintenance Equipment Co.; vice-president—H. H. Talboys, Nordberg Mfg. Co.; secretary—C. H. White, Industrial Brownhoist Corp.; treasurer—John S. Hutchins, Ramapo Ajax Division, American Brake Shoe & Foundry Co.; new directors, three-year term—C. D. Young, Metal & Thermit Corp., and R. C. Flodin, International Harvester Corp. The exhibit was held in conjunction with the convention of the American Railway Engineering Association.

British Trade Agreement Causes Little Concern

WASHINGTON—Machinery and metals industries are showing little concern over hearings in progress on the British trade agreement. Division III of the Committee for Reciprocity Information, which covers the metal and metal-working industries, started testimony March 16. Most witnesses told the same story: That reductions of rates on imports of metals and metal products would work havoc with profits and labor. But they felt no real concern that rates would actually be cut. Bucyrus representatives told the committee that they would like a British concession on excavating machines, that they are not concerned about U. S. rates on imports.

Index of Machine Tool Orders

Based on Volume of Shipments for 1926

Month	Index of Orders: Domestic	Index of Orders: Foreign	Index of Orders: Total	3 Months' Average Index	% Foreign to Total Orders
1937 — February	122.4	42.8	165.2	207.7	26
March	172.1	39.5	211.6	192.4	19
April	232.5	50.0	282.5	219.8	17
May	161.4	47.1	208.5	234.2	23
June	137.6	54.2	191.8	227.6	28
July	115.4	55.7	171.1	190.5	33
August	129.5	50.3	179.8	180.9	28
September	119.0	91.7	210.7	187.2	44
October	89.1	62.9	152.0	180.8	41
November	63.3	64.4	127.7	163.5	50
December	53.5	89.2	142.7	140.8	63
1938 — January	43.2	75.2	118.4	129.6	63
February	48.7	27.0	75.7	112.3	35

Distribution of Orders

Average Index of Individual Companies Based on 1926 Level of Business	Companies In Per Cent of Total Number Reporting: 1936 2nd Quar.	1936 3rd Quar.	1936 4th Quar.	1937 1st Quar.	1937 2nd Quar.	1937 3rd Quar.	1937 4th Quar.	1938 Jan.	1938 Feb.
200-up	17.2	15.8	28.4	31.6	38.5	33.4	23.0	21.1	8.7
100–199	32.6	28.8	30.2	32.8	29.1	30.2	23.2	18.8	14.5
60– 99	19.0	22.9	19.5	16.4	15.1	15.7	18.6	15.0	24.6
20– 59	21.8	21.7	15.2	12.2	11.4	12.7	22.0	27.8	34.8
Less than 20%	9.7	10.8	6.7	7.0	5.9	8.0	13.2	17.3	17.4

Successful Tool Exhibition Leads to Demand for a Yearly Show

A.S.T.E. elects a strong slate of officers for the coming year. Technical sessions draw manufacturing executives

DETROIT—More than 25,000 industrial supervisors, tool and production engineers and others connected with the metal-working industry jammed the first Machine and Tool Progress Exhibition staged at the Public Auditorium from March 9-12 by the American Society of Tool Engineers. So encouraged were the directors by the turnout that they voted to heed popular demand and hold another show next year. It is anticipated that Detroit will again be the location, but no announcement was made. Visitors to the Show inspected booths of 162 exhibitors, many of which reported that much business was placed.

Walter F. Wagner, master mechanic of the Lincoln Motor Car Co., and a member of the board, was elected president at the annual meeting. Mr. Wagner served as second vice-president during the past year. Other officers elected were: first vice-president, James R. Weaver, director of equipment, inspection and test, Westinghouse Electric & Mfg. Co.; second vice-president, George A. Smart, tool supervisor, Allis-Chalmers Mfg. Co.; treasurer, Frank R. Crone, chief tool designer, Lincoln Motor Car Co.; secretary, Charles F. Staples, chief engineer, Giern & Anholtt Tool Co., Detroit.

On Wednesday evening Dr. E. J. Abbott, president, Physicists Research Co., talked on "Preparing Standards for Surface Quality." He pointed out the need for a universal method for specifying grades of surface finish and discussed the work now being done by the American Standards Association.

Harry T. Woolson, executive engineer, Chrysler Corp., in discussing Dr. Abbott's paper from the engineer's viewpoint, brought out the need for specifying the method of producing a finish as well as the quality of finish in any system of specifying surface quality. Also, he brought out the importance of knowing the direction as well as the depth of the minute scratches that exist on the surface of a finished piece.

The shop man's attitude toward surface-quality specifications was discussed by R. V. Hutchinson, design engineer, Olds Motor Works, and F. J. Malone, assistant to the president, Hercules Motors Co. Mr. Malone's paper was read in his absence by C. Ray Brunner, tool engineer, Dodge Brothers Div., Chrysler Corp. In his paper, Mr. Malone pointed out the advisability of developing samples of standard finishes for visual comparison with that produced on a part, since any accurate method for measuring the quality of the finish probably will require expensive equipment and trained operators.

Thursday evening's technical session was opened by Edwin Johnson, manager of cost studies, Packard Motor Car Co., with a paper entitled "Selecting and Buying Equipment." Mr. Johnson analyzed the responsibility of the purchasing department, master mechanic, tool engineer, process engineer, layout department, time study department, plant engineer, plant manager and foreman in properly selecting proper tools and manufacturing equipment.

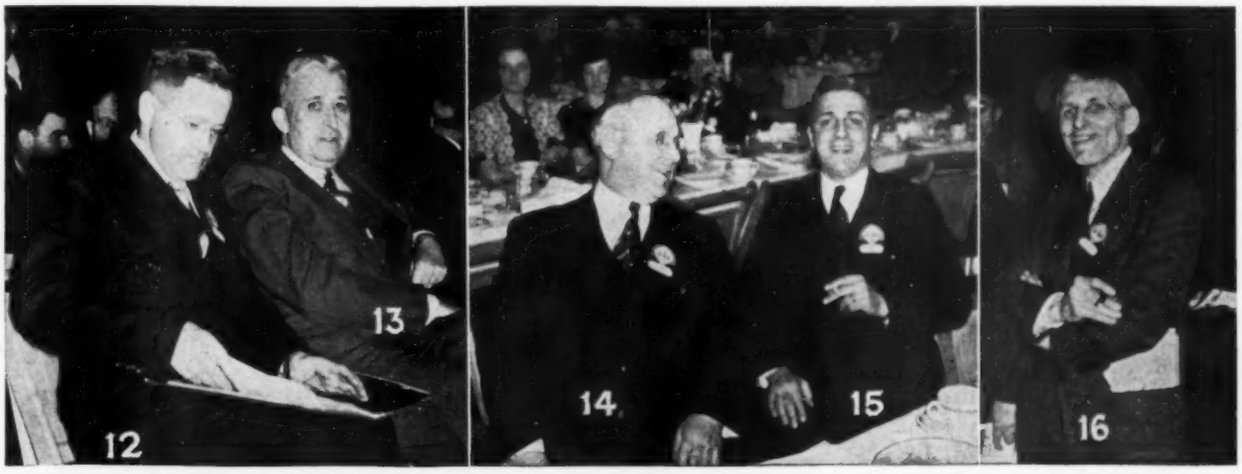
P. W. Brown, general factory superintendent, Wright Aeronautical Corp., in discussing Mr. Johnson's paper from the viewpoint of the production executive, outlined the policies adopted by his organization to insure proper selection of needed equipment and discussed the responsibilities assigned to each shop supervisor and production engineer. Tom Higgins, purchasing agent, General Electric Co., stressed the advisability of keeping the purchasing department fully informed throughout all stages of negotiations for new equipment.

A. H. d'Arcambal, consulting metallurgist, Pratt & Whitney Co., from the supplier's viewpoint said that an expensive piece of production equipment is no better than the cutting tools selected for the job. Often too little consideration is given to this point, resulting in loss of much of the capacity available in modern manufacturing units.

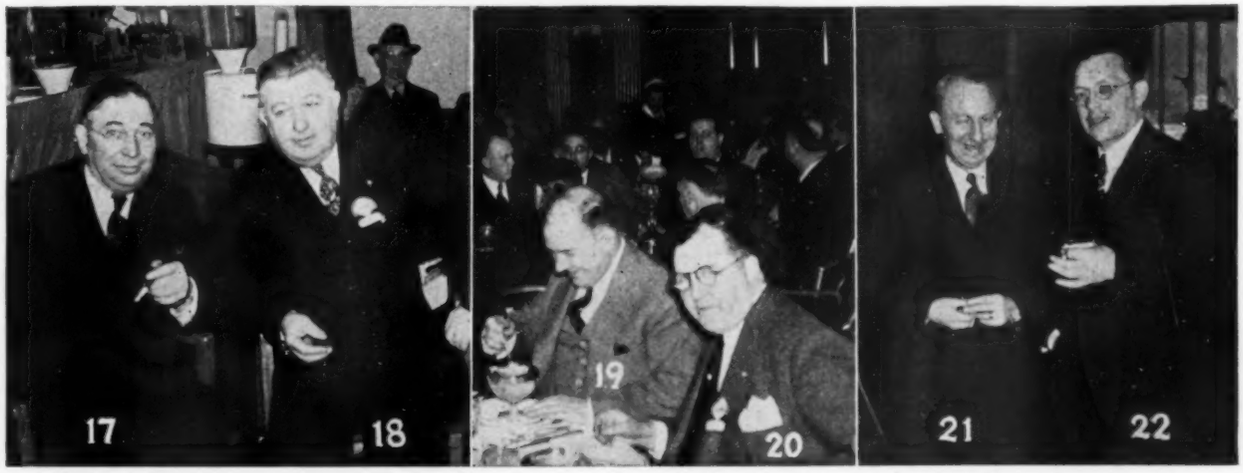
Nearly 500 members of the Society and their guests attended the annual dinner on Friday evening. "The Tool Engineer and the World He Is Making" was the subject of the address by Ralph E. Flanders, president, Jones & Lamson Machine Co. Mr. Flanders complimented the Society on the current exhibition and remarked that it filled a need for a showing of tools and accessory equipment.

Tell Berna (1) general manager of the National Machine Tool Builders Association; Ralph E. Flanders (2) president of the Jones & Lamson Machine Company, and guest speaker; J. R. Weaver (3) new first vice-president of the A.S.T.E., and Frank A. Shuler (4) retiring president, were present at the annual dinner. Charles F. Staples (5) is the new A.S.T.E. secretary, and Frank R. Crone (6) is the new treasurer

A. H. d'Arcambal (7) metallurgist, Pratt & Whitney Co., and George A. Smart (8) new A.S.T.E. second vice-president relax after a few beers. W. P. Kirk (9) sales manager, Pratt & Whitney, likes them long and strong. Harry T. Woolson (10) of Chrysler discussed the engineer's viewpoint about surface quality, and was followed by C. R. Brunner (11) who gave the shop angle from F. J. Malone's discussion



Edwin Johnson (12) of Packard, talked on "Selecting and Buying Equipment," and Tom Higgins (13), G.E. purchasing agent, discussed it. P. W. Brown (14) of Wright Aeronautical gave the production executive's viewpoint on purchasing equipment. He is flanked by Remo Rege (15) manager of Wright's production engineering department. A. F. Murray (16) manufacturing engineer, Westinghouse, found much of interest at the show



William K. Stamets (17) Pittsburgh machine tool dealer, with Berhard G. Tang (18) general superintendent of the G.E. Schenectady Works. E. C. Brandt (19) of Westinghouse and Harry Barney (20), Pittsburgh machine tool dealer, get off to a good start at the annual dinner. A.S.T.E. directors L. D. Rigdon (21) of Westinghouse, and R. M. Lippard (22) of Heald Machine were pleased at the Show's attendance

DETROIT LETTER

Buying of equipment for 1939 gets under way . . . General Motors to be big purchaser . . . Used Car Week only partially successful . . . Industry resigned to low production and sales this year . . . Chrysler and Hudson revise labor contracts

DETROIT—Buying of equipment for 1939 model changes has at last gotten under way in the Detroit area. Machine tool builders are busy making quotations and week by week are wearing broader smiles as quotations turn to orders.

General Motors is reported planning one of the most extensive retooling programs in its history. First of the G.M. divisions to break loose with machinery releases has been Chevrolet at its gear and axle plant. It is reported to have expended $250,000 for new equipment there. Pontiac is three to six weeks away from its buying program, which will include machines for a new axle. Buick is not expected to be represented importantly in the purchasing program mainly due to large outlays made last year.

Chrysler, with major changes in cars in prospect for 1939, has been surprisingly slow in making releases. Dodge has come through with some orders the past week or so in connection with a new front-end construction, said to be of the independently-sprung type, and also with a "finger-tip" type of gear shift mechanism similar to that used on several other makes of cars this year. Plymouth has released virtually nothing as yet. There seems to be considerable indecisiveness as to just what should be done to Plymouth cars for 1939.

Rouge Expansion Plan

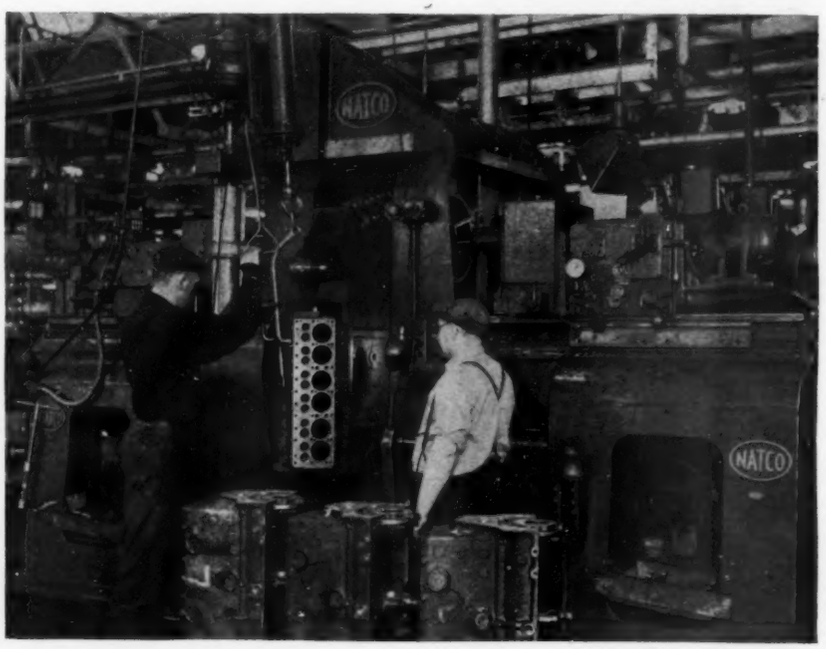
Ford is an excellent source of machinery business and is in the midst of its big expansion program at the Rouge plant. It is reported to be planning for '39 a new car which will set everybody in the industry talking. Ford must yet buy a substantial amount of equipment for its consolidated tool and die shop.

Retail sales and production promise to be so poor this year by comparison with 1937 that the industry has about decided to be philosophical about the situation and concentrate its energy on putting out "bang-up" new models in the fall. As estimates of 1938 sales have gradually been whittled down, so opinion has crystallized that innovations next year should be more radical than originally planed. Buick, for example, is said to have started die work in outside shops only to call a halt to the program, pay off the shops and start over. Revised designs are understood to resemble somewhat the Lincoln-Zephyr.

Several car makers intended to spend a lot of money on changes for 1938, but when the strike epidemic hit the industry in the spring of 1937 they promptly abandoned that idea and decided to make as few changes as possible. This eventually worked to the disadvantage of the industry because many car executives freely admit that the fact that 1938 cars look like 1937 cars partly accounts for the buying public's apathy. There is considerable sentiment too that the public won't spend freely again for new cars until prices come down.

The automotive industry isn't optimistic as to immediate prospects. Used car week came and went with a fanfare such as has seldom been seen, particularly in off-seasons, but it left sales managers scratching their heads wondering what it had accomplished. Ford was about the only organization that kept a day-to-day check of sales and released them. Ford dealers, for that matter, got behind the plan much better than other dealers, especially so far as reducing prices was concerned. As a result Ford wound up with an impressive total of 57,894 used cars sold for more than $14,000,000. Ford dealer stocks of used cars were claimed to have been cut by 22,800 units.

Other companies did not fare so well, for a check-up showed a decline of only two per cent in used car stocks for the industry as a whole. However, the value of used car inventories was cut quite a bit. Dealers took older cars in trade for newer ones. On the other hand, dealers sold new cars at a slighly faster clip as the result of a seasonal sales gain and thus again were taking additional used cars in trade. Many dealers did



No back-breaking labor is involved in handling heavy cylinder blocks at Chrysler since the entire plant is equipped with compressed air hoists. Besides drilling the hole for the oil pump and distributor shaft this automatic machine drills 25 other holes in the block

not enter the used car campaign wholeheartedly. They felt that this was not the time to unload inventories at sacrifice prices when Spring might bring an opportunity for getting more money for the same cars.

Plans for setting up a system for junking old cars are in the wind. Factories are trying to figure out a way. Meanwhile the National Automobile Dealers Association has a plan of its own which will probably be sprung on the industry in the next few weeks.

On the whole, the industry is fairly well resigned to reasonably low levels of production and sales for the balance of the current model year and is figuring ahead to the 1939 season for better business. Aside from a mild seasonal pick-up, not much is expected.

On the labor front the factional fight within the U.A.W. has been watched with major interest by the industry. The U.A.W. is in the midst of its annual election of officers in various locals and in most of them bitter factional rivalries have developed between the Homer Martin and the "Unity" groups. So far, the more conservative Martin faction has had the best of it, carrying the Flint elections with majorities that surprised even themselves. In Detroit the battle has been closer, with the Unity group winning several elections. Martin groups, however, came out victorious in such locals as Packard, Budd Wheel, Motor Products, Federal-Mogul and Holley Carburetor. When the noses are all counted, it wouldn't be surprising to find the Martin administration even more firmly entrenched than at present.

They Didn't Like It

Revision of the supplementary agreement to the General Motors contract announced a couple of weeks ago was used by the Unity group as a factional weapon. They didn't like it and said so. The revisions included restrictions on the number of committeemen (not to exceed 1 to 400 employees in large plants) during slack times; districting of plants for representation by committeemen; adjustment of number of committeemen every six months; provision for contacts between shop committees and high local management on grievances not adjusted down the line; provision for direct settlement of grievances between employes and foremen; committeemen to be paid for only two hours instead of four while engaged in grievance settlement work; and notice of contract termination by either side to be reduced from sixty to thirty days.

Meanwhile Chrysler contract renewal negotiations are proceeding fairly amicably. Used as window dressing to provide a major "point of issue" was whether or not the union should represent office workers. Since the original Chrysler contract had no such provision it is considered unlikely that the revised contract will incorporate such a provision either. And the union really doesn't expect it.

The Hudson contract has also come up for renewal and preliminary negotiations have been held. Major development at Hudson is the expected lengthening of the work-week and lay-off of additional employees. The union apparently is not objecting to the plan. The idea is that those who will stay on the job will have a better chance of making a living wage, while those laid off can go on WPA and make more than at Hudson. A similar plan went through without difficulty some time ago at Briggs.

Huge Foreign Orders Exceed Estimates

Russia and Japan Continue $100,000,000 Spree of 1937

NEW YORK—Magnitude of foreign orders for armament machinery, industrial equipment (mainly metal-working) and raw materials would be wholly unsuspected from published records. These orders have been pouring in from all over the world, and their classification as to kind and purpose is a stupendous task. Nevertheless it is possible to throw some light on how exceptional exports of heavy industrial equipment are aiding America's trade balance.

Those "in the know" say that Russia bought $69,000,000 worth of industrial equipment here last year and that Japan bought $30,000,000 worth of metal-working machinery. Russia's total included $45,000,000 worth of metal-working machinery of which $25,000,000 were actually for machine tools. And, of course, Great Britain, France, Italy, and some South American countries were active during the year.

The big spenders bid fair to continue their vast outlays. Although Russian business in January and February is normally slower than during the rest of the year, the first two months of 1938 have outstripped the same period of last year. Present expectations are that Russia will buy more than ever from the United States. Here are the figures for the Soviet Union's purchases from this country:

Year	Power-Driven Metal-Working Machinery
1929	$ 2,594,000
1930	13,239,000
1931	22,492,000
1932	3,468,000
1933	952,000
1934	2,799,000
1935	1,737,000
1936	15,247,000
1937	45,000,000

Japan is also likely to exceed last year's total of $30,000,000 for metal-working equipment. While imports are under rigid control of the Finance Ministry, and only most-needed items are being placed, orders given in January and February have been approximately $3,000,000 per month, according to reliable estimates.

Better than average foreign markets for steel have been observed during the last few months, probably exceeding 5 per cent of total domestic production. Bars, plates, sheets and wire are in demand. The European cartel, of which some of the larger producers are unofficial members, as permitted by the Webb-Pomerene Act, is again working smoothly.

There are indications, however, of a falling off in the near future, unless European countries should expand armament programs as a sequel to the gobbling up of Austria, and thus turn to this country for raw materials.

Machine tool sales to Great Britain have been diminishing, probably because English dealers stocked up heavily at the beginning of the buying rush and have been in a better position to make deliveries than their American suppliers. The British Board of Trade has so far followed a flexible policy in admitting equipment without duty, sometimes applying it and other times not as domestic exigencies demanded.

South American business has hit a snag—orders are poor and inquiries are in smaller volume, though there are some good prospects. The German-Austrian affair may help the competitive situation, because Germany may be forced to forego some of her exports to South American countries if more intensive general rearmament in Europe follows her action.

WATCHING WASHINGTON

Naval program calls for billion dollar outlay in addition to carrying out the 1934 building schedule . . . 800,000 tons of steel needed for Navy ships . . . President to decide on speed of program . . . 950 airplanes to be added to Navy

McGRAW-HILL WASHINGTON BUREAU
(Paul Wooton, Chief)

WASHINGTON—Whether the United States wants a big Navy to defend this country only, or to defend the western hemisphere under the Monroe Doctrine, or to "quarantine" the dictators, is probably not clear even in Washington's high places. But the administration sees the end of peace in mere isolation. It has crashed through opposition lines and will build costly sea power for whatever may come.

Today the world forgets about all the navy limitation treaties. All have been scuttled but one, and it's just a form. It's the Franco-British-American agreement to limit cruisers to 8-in. guns and battleships to 35,000 tons. The Japanese refused to reveal what they are building. Whether they are bluffing no one knows as yet. Bluff or not, their stand in effect removes all limits for the present. Probably no more agreements will be made now. The only limit is what the taxpayers can stand up under, but the chances are that our new battleships will be above the 35,000-ton limit.

There are three fundamentals in the navy building program. *First,* under the Washington Conference of 1921, the United States scrapped more and better warships than did England and Japan. Those two countries went ahead, under their treaty rights, and built their navies up to the maximum allowed, while the United States, under the Congressional isolation policy, let its navy go far below treaty strength. *Second,* by the Act of March, 1934, under growing international tension, a belated rebuilding program was adopted. By this program the Navy would attain its full treaty allotment of under-age strength by 1941. At the present time we are only a little behind schedule toward that goal. And *third,* under the Vinson bill which will shortly be enacted, inspired by repudiation of all treaties, the 1934 program will be increased by 20 per cent at a cost of $1,000,000,000 plus.

While all the talk is about the huge increase under the pending bill, construction is still going on under the 1934 act. The 20 per cent increase, plus the 1934 program, will be the actual program. What it adds up to is shown in the accompanying table.

This building program will not boom the steel industry, but it *will* demand big orders of machinery and equipment to make the yards ready. Then 50 per cent of the cost of the building will go into ship's machinery. And if the total authorization is hurried to completion, more skilled and structural workers would have to be trained. Annual maintenance cost will be increased 25 to 50 million dollars.

It must be remembered, though, that the President has the final word on the rate of construction of the billion-dollar authorization. What he does will depend on the turn of international events. Should an emergency threaten, he would undoubtedly order the whole program put under forced draft. If he so ordered, navy officials believe that all yards, government and private, brought to full capacity by rehabilitation, could lay down the whole program after the usual preparatory period. But launching of the total program at once is not expected. Probably it will extend over a period of five years or more.

The Vinson law says, as everybody knows, that at least 50 per cent of the building must be done by government shipyards. But the President can change that, too, in the public interest. Actually the 50-50 law is no law at all, but merely the expression of a Congressional policy. All the construction could be done by the government or all of it could be done by industry. Barring emergency, it will be divided up as in the past. It's almost certain no battleships will be built on the West Coast, but they could be, if necessary. The coast will get its full share of the other ships, as provided in the bill.

In addition to the 68-ship schedule, the billion-dollar program calls for 950 airplanes of all types, to bring the Navy up to a maximum of 3000 aircraft. There is a possibility this "maximum" will be changed to read "minimum", thereby giving the President no choice but to build the full 950. Aircraft manufacturing authorities believe the industry could turn out this requirement very promptly if necessary. Qualified plants could add one, or in some cases, two shifts. Engineers are plentiful; skilled labor would have to be built up. Some of these plants are heavily loaded with foreign orders, which could be rapidly curtailed.

A rigid airship is to be built with $3,000,000 of the experimental fund.

Here's the Big Navy Program

	Now Building	Regular 1939 Program	Billion Dollar Increase
	No.	No.	No.
Battleships	2– 70,000 tons	2– 70,000 tons	3–105,000 tons (or possibly more)
Aircraft carriers	2– 34,600 tons	.....	2– 30,000 tons
Cruisers	8– 80,000 tons	2– 10,000 tons	9– 68,754 tons
Destroyers	36– 56,200 tons	8– 12,000 tons	23– 38,000 tons
Submarines	15– 21,740 tons	6– 8,130 tons	9– 13,658 tons
Sub Tenders	.....	1– 9,000 tons	3– 27,000 tons
Destroyer tenders	1– 9,450 tons	.....	5– 45,000 tons
Seaplane tenders, large	1– 8,800 tons	.....	4– 33,200 tons
Seaplane tenders, small	.....	.....	7– 11,550 tons
Oilers	.....	1– 8,000 tons	.....
Fleet tugs	.....	1– 1,150 tons	.....
Mine sweepers	.....	1– 600 tons	.....
Repair ship	.....	.....	3– 28,500 tons
*Total	65–280,790 tons	22–118,880 tons	68–400,662 tons

*Displacement tonnage runs almost equivalent to steel tonnage.

Auto Parts Makers Elect C. C. Carlton

DETROIT—Automotive Parts & Equipment Manufacturers Association held its annual meeting on March 10, preceded by a board of directors meeting at which the following officers were re-elected for 1938: C. C. Carlton, secretary of Motor Wheel Corp., president; Hugh H. C. Weed, vice-president of Carter Carburetor Corp., vice-president; M. C. Dewitt, vice-president of Champion Spark Co., secretary; and D. W. Rodger, vice-president of Federal Mogul Corp., treasurer. Clarence O. Skinner remains general manager of the association.

In addition to the above officers, the following directors have just been elected by the entire parts industry for 1938; F. C. Crawford, president of Thompson Products, Inc.; C. S. Davis, president of Borg-Warner Corp.; Charles Getler, president of Houdaille-Hershey Corp.; John P. Mahoney, vice-president of Bendix Products; C. E. Wilson, vice-president of General Motors Corp.; C. C. Bradford, president of Eaton Manufacturing Co.; D. H. Kelly, vice-president of Electric Auto-Lite; E. A. Hall, president of the Hall Manufacturing Co.; E. F. Deacon, president of Climax Engineering and head of the Internal Combustion Engine Institute and J. E. Otis, Jr., president of Stewart-Warner Corp. Messrs. Wilson, Davis, Getler and Crawford were elected to serve two-year terms.

According to Mr. Skinner, the automotive parts and equipment industry sold approximately a billion dollars worth of products during the year ending in June of 1937.

PERSONALS

GERALD KOCHENDORFER, sales manager of the National Tool Co., has been elected a director and a member of the executive committee. He fills the vacancies caused by the death of H. J. LEES. Mr. Kochendorfer joined National Tool to take charge of sales last June. He was previously associated for seventeen years with Warner & Swasey Co., and for fifteen years of this period was district manager in Chicago.

L. D. SMITH has been elected vice-president in charge of operations of the Tin Plate Division, McKeesport Tin Plate Co. THOMAS D. DOUGLAS has been elected secretary of the company.

J. W. REAVIS has been elected to succeed the late FRANK H. GINN as secretary, Midland Steel Products Co., Cleveland. OTTO MILLER will succeed Mr. Ginn as a director in the company.

DAVID E. ROSS, formerly president, Ross Gear & Tool Co., manufacturer of steering gear, Lafayette, Indiana, has been made chairman of the board. E. GEUNEWALD, formerly vice-president and general manager, succeeds him as president.

LEE B. GREEN

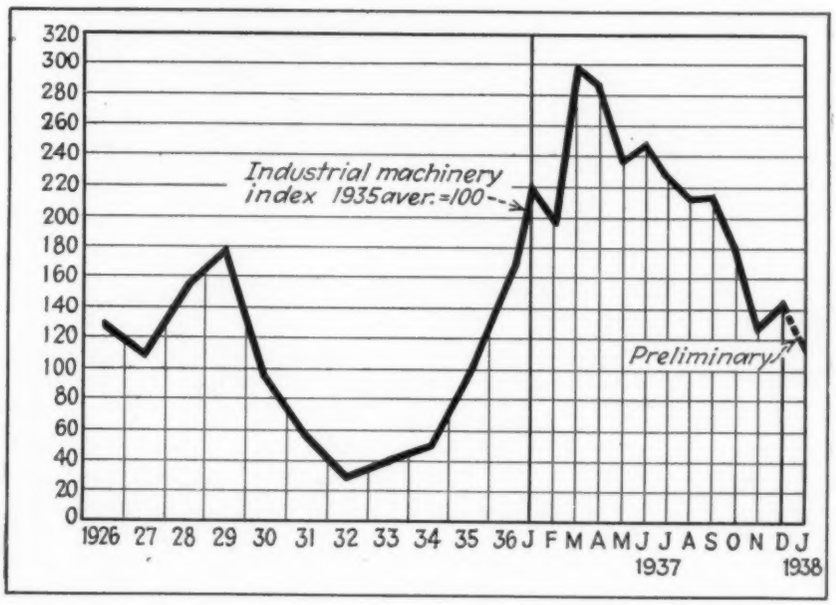
LEE B. GREEN has been made general manager of the Steelweld Machinery Co., Cleveland, manufacturers of press brakes, bulldozers and special metal-forming machinery. Mr. Green was formerly vice-president and works manager of the Globe Machine & Stamping Co., and brings to his new work a comprehensive and practical experience in dies, tools and the application and uses of metal-forming machinery. He was formerly superintendent of the Lincoln Motor Co. in Detroit, and before that general master mechanic of the Timken Roller Bearing Co.

LOUIS J. PURDY has been appointed general manager, Dodge Truck Division, Chrysler Corp. Mr. Purdy joined the Chrysler organization in 1931 as a member of the executive staff of W. J. O'NEIL who was then vice-president of Dodge in charge of manufacturing. Since that time Mr. Purdy has headed the Chrysler central estimating department and acted as general production manager in several Chrysler plants. He had charge of the construction of the new Mound Road plant for the Dodge Division.

EARL A. TANNER, formerly executive vice-president, Milcor Steel Co., Milwaukee, Wisconsin, has been elected president. He succeeds LOUIS KUEHN who was named chairman of the board, a newly created position. E. L. LIPMAN succeeds A. J. LUEDKE as secretary and treasurer. Mr. Tanner has been with the firm for eighteen years. He was general manager of the company's Canton, Ohio, plant for six years and was elected a vice-president in 1931.

HUGH COURTEOL has been elected president of Mercoid Corp., Chicago. In recent years he has been vice-president and manager of operations, General Motors Holding Corp.

CHARLES S. PEARCE has been appointed secretary of the Porcelain Enamel Institute, Chicago, Ill., to fill a position vacated by GEORGE P. MACKNIGHT, according to an announcement by FRANK E. HODEK, JR., Mr. Pearce was formerly head of the porcelain enameling department, Frigidaire Corp. and enameling operations of the Davidson Enamel Co.



Machinery Index Off Again

Preliminary calculations for January with several factors missing indicate that machinery orders dropped seriously in January. The *American Machinist* Index stands at 117 as against 146 in December and 224 in January 1937.

JOSEPH SLEPIAN has been appointed associate director of the Westinghouse Research Laboratories. Mr. Slepian supervised development of the de-ion circuit breaker, and is considered one of the world's outstanding electrical engineers.

DR. C. L. DINE has been elected president of the Streine Tool & Mfg. Co., New Bremen, Ohio.

GEORGE GREIMAN has been appointed superintendent of the Manley plant of the American Chain Co., West York, Pa. He was formerly an executive of the company's Adrian, Mich., plant for 10 years.

ROBT. A. TRUMPIS has been made general superintendent of the Universal Form Clamp Co. with plants in San Francisco, Jersey City and Chicago. Mr. Trumpis just completed a three-year survey and standardization program in the plant.

T. N. MCGOWAN was recently elected to the board of directors, Sundstrand Machine Tool Co., Rockford, Ill. Mr. McGowan has also been made a director of Burd Piston Ring Co., Rockford.

BUSINESS ITEMS

Fairbanks, Morse & Co., last week formally opened its display room on the first floor of its new headquarters at 600 S. Michigan Ave., Chicago. Modernization of the building has just been completed with the executive, sales and departmental offices occupying the first five floors of the building. The company moved to this building from its old location at 900 S. Wabash early in January.

Gar Wood Industries, Inc., is moving its motor coach manufacturing division from Detroit to the Marysville, Ind., plant obtained in acquisition of Gar Wood, Inc., boat builder, in January.

American Rolling Mill Co. plans to spend $300,000 for improvements on Zanesville, Ohio, plant according to C. VERITY, executive vice-president.

The Meehanite Metal Corp., Pittsburgh, has appointed the following additional domestic licensees: The Atlas Foundry Co., Detroit; General Iron Works, Denver, Colo., a division of the Stearns-Rogers Mfg. Co.

Alberty Welding and Machine Engineering Corp., 523 West Sixth St., Los Angeles, has been incorporated for $25,000.

Tool Equipment Sales Co., 23 S. Pulaski Rd., Chicago, Ill., has been appointed exclusive agents for the Pines Winterfront Co., for their commercial stamping department in Chicago and surrounding territory, on both large and small stampings, and enameling.

Thiokol Corp., manufacturers of oil-proof synthetic rubber, announces that effective April 1, the general offices and laboratory of the company will be located at 870 North Clinton Ave., Trenton, N. J. For seven years the company's plant and general offices have been situated in Yardsville, N. J.

LESLIE M. GUMM

To serve industry better, the Westinghouse Electric & Manufacturing Co., has announced a realignment of the Industrial Department. Three new departments, Industrial, Resale and Industry Engineering have been formed to meet the changing conditions in industrial markets.

Electrification of industries such as iron and steel, mining, chemical, petroleum and public works will be served by the Industrial Department. C. B. Stainback will be manager.

The new Industrial Department will consist of six industry sections—Metal Working; Mining; Petroleum and Chemical; Public Works and Communications; General Mill; and Marine Electrification.

Among the managers for the various sections, Industrial department, are:

Leslie M. Gumm, manager, Metal Working Section, will be in charge of electrification of steel mills and automotive plants.

J. S. Parry, Jr., manager, Mining Section.

Q. M. Crater, manager, Petroleum and Chemical Section.

G. D. Bowne, who has been manager, General Mill Electrification Section, continues in that relationship.

J. R. Fulton continues as manager of the Marine Electrification Section.

The Resale Department will devote its facilities to servicing manufacturers whose products incorporate electrical equipment and other secondary distribution channels such as industrial agents and jobbers. However, those companies building equipment for a specific industry will remain the responsibility of the Industrial Department. Such activities as machinery electrification, appliance electrification, and construction industries and contractors will be included in the new department. Bernard Lester, also assistant manager of the former Industrial Department, becomes manager.

Backing up both departments with application engineers, the Industry Engineering Department will provide a corps of engineers experienced in electrical problems of the several industries. Its engineers will be available for consultation and development work. C. A. Powel will be manager.

Columbia Machine Tool Co., Hamilton, Ohio, has purchased all the Long & Allstatter records, drawings, blueprints and patterns, and is prepared to furnish repairs and also new improved-design plate and structural steel machinery such as punches, shears, presses, press brakes, spacing tables, special forming machinery and other allied equipment.

Cutler-Hammer, Inc., Milwaukee, manufacturer of electric control apparatus, has moved its Cincinnati office to the American Bldg., Central Parkway at Walnut.

The Manning, Maxwell & Moore Co., 446 Communipaw Ave., Jersey City, N. J., has been appointed distributors for the Oliver-of-Adrian line of die-making machines for the Metropolitan New York territory.

The Boston Gear Works, Inc., North Quincy, Mass., has been appointed general distributor for the United States and Canada, for "Oilite" oil-cushion precision bronze bearings made by the Chrysler Corp.

The Fosdick Machine Tool Co., Cincinnati, has appointed Austin-Hastings Co., Inc., Cambridge, Mass., as New England distributor for its line of radial drills, sensitive drills, upright drills and jig borers. Austin-Hastings have offices in Providence, Worcester and Portland.

OBITUARIES

ELWOOD MCGUIRE, 84, founder of the Dille & McGuire lawn mower factory in Richmond, Ind., in 1870 and for many years its president, died recently.

GEORGE M. SPENCER, 66, for years president of the American Lawnmower Co., Muncie, Ind., died recently.

RALPH A. FIELDES died March 10 in Chicago at the age of 54. He was first assistant to W. F. SCHAFF, vice-president, New York Central.

WILLIAM K. LANMAN, 65, formerly president and general manager of the Columbus Bolt Works, Columbus, Ohio, died March 10. He retired in 1917.

EDWARD J. MORGAN, president of the Coulter & McKenzie Machine Co., Bridgeport, Conn., died March 4, aged 78.

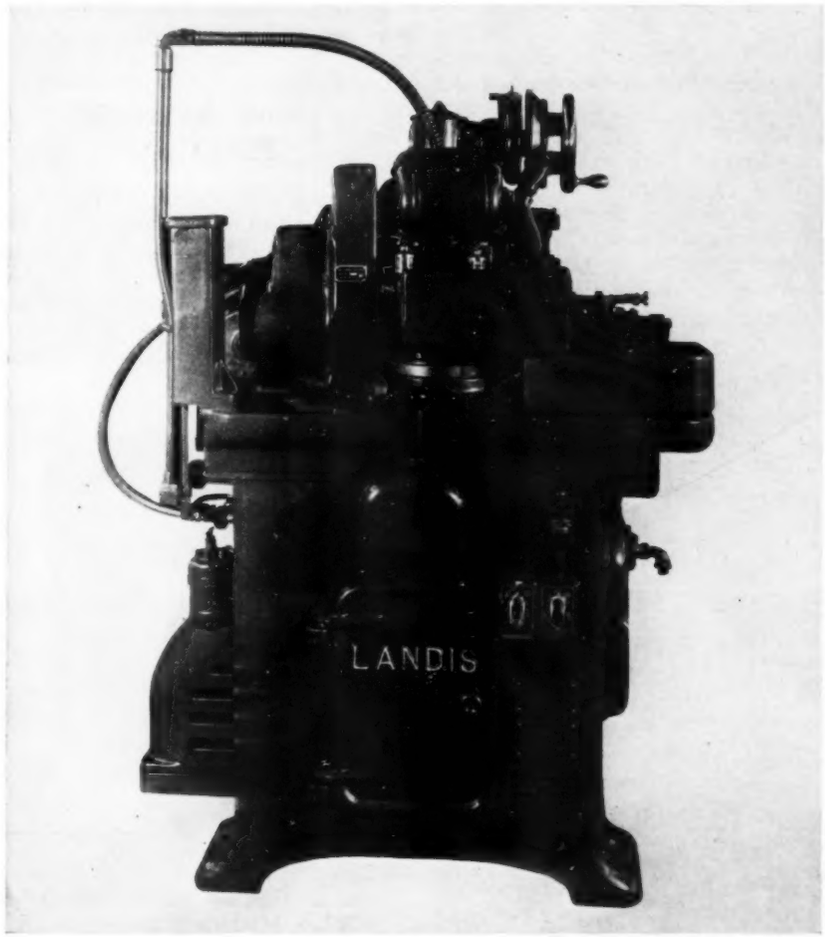
MEETINGS

AMERICAN GEAR MANUFACTURERS ASSOCIATION. Twenty-second annual meeting, April 25-27. General Brock Hotel, Niagara Falls, Canada. J. C. MCQUISTON, manager-secretary, Penn-Lincoln Hotel, Wilkinsburg, Pa.

GRAY IRON FOUNDERS' SOCIETY. Annual meeting, March 25. Hotel Statler, Buffalo, N. Y. W. W. ROSE, executive vice-president, 1010 Public Square Bldg., Cleveland.

SOCIETY OF AUTOMOTIVE ENGINEERS. National passenger car meeting, March 28-30. Hotel Statler, Detroit.

SHOP EQUIPMENT NEWS



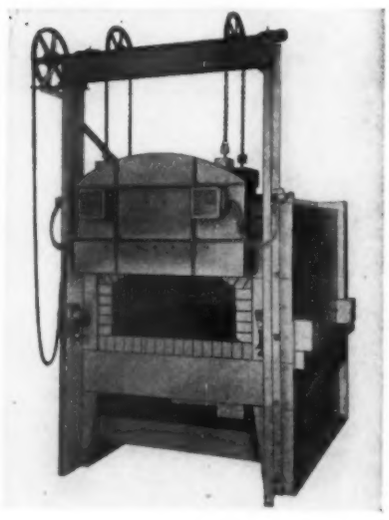
Landis Type C Chucking Grinder

Designed economically to grind small parts that cannot be held between centers, the 3-in. Type C hydraulic chucking grinder announced by Landis Tool Co., Waynesboro, Pa., features a work head which may be swiveled 90 deg. Operation of the machine is determined, to a certain extent, by the nature of the part being ground. One manufacturer uses the machine for grinding outer raceways of small inner roller bearing rings. This is a taper grinding operation requiring a slight swiveling of the work head. Here all the operator has to do is slip the ring on the expanding collet and push the control lever at the front of the bed. Work is clamped immediately, the wheel feeds in rapidly until it is about to come in contact with the work, then it slows down to the predetermined grinding feed and then feeds in at this slower speed. Just before the work is down to size, the wheel base comes against a positive stop and, after a "sparking out" period, the wheel base moves back to its original position. At the same time the work is unclamped and is ejected from the expanding collet. Work spindle rotates continuously.

Among the features built into the machine is a hydraulic straight infeed mechanism. The wheel truing device is hydraulically operated and, being mounted at the rear of the wheel, may be used without disturbing the work. A guard is provided which swings automatically over in front of the wheel when the wheel base recedes to its back position and swings out of the way as the wheel base moves forward. This eliminates the possibility of the operator's hand coming in contact with the wheel during the loading or unloading operation. All electrical control equipment is built into the machine and protected from coolant, grit, and dust. A part of this control equipment is an electrical timing device which regulates the length of the grinding cycle. All motors used are of the constant speed type, the wheel drive motor being of 1½ hp. capacity, while a ⅓ hp. motor drives the work and a 1 hp. motor operates the pump. Net weight, 3,200 lb.

Lindberg "Tubulaire" Box-Type Furnaces

Lindbergh Engineering Co., 229 N. Laflin St., Chicago, Ill., offers a line of box-type furnaces equipped with "Tubulaire" electric heating elements. These elements are claimed to combine circulation with greater radiating surface to give increased



heating rapidity and uniformity. Elements are nickel-chromium tubes which, when heated, act as individual stacks and create definite circulation within the furnace. Thus, furnace temperature is equalized and continual circulation insures a uniform gas analysis throughout the chamber when special atmospheres are used.

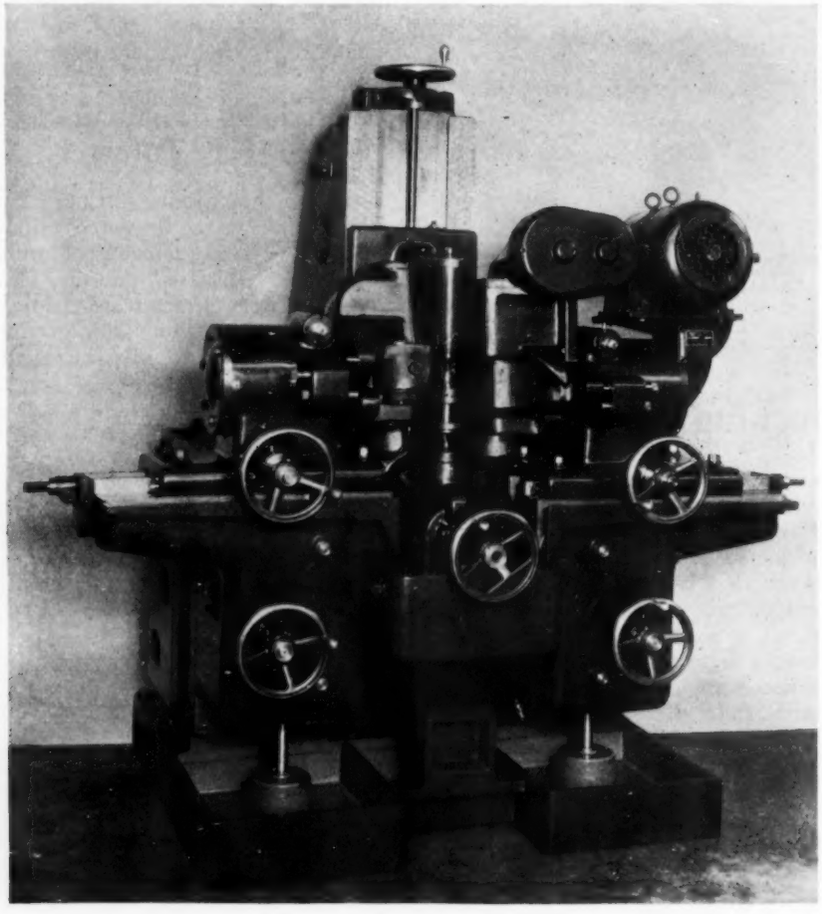
Box-type furnaces equipped with these units are available in capacities ranging from 10 to 170 kw. and with chamber dimensions ranging from 10 x 18 x 10 in. to 48 x 96 x 36 in. Pot-type furnaces ranging from 12 in. diameter by 18 in. deep to 24 in. diameter by 24 in. deep also are available equipped with "Tubulaire" elements.

Michigan Duplex Gear Finisher

Designed for use where requirements call for finishing both large and small gears on a single machine, or where it is desired to finish two gears simultaneously, as on a cluster, the Duplex gear finisher announced by Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich., also can be used for finishing both sides of a herringbone gear simultaneously. The two independent rotary cutters are universally adjustable. Two hand wheels provide independent adjustment as to height, two other hand wheels provide independent lateral settings to control size, while individual worm and wheel adjustments set the amount of crossed axis desired for each cutter. Each cutter head is provided with a sine-bar setting for adjusting to correct lead.

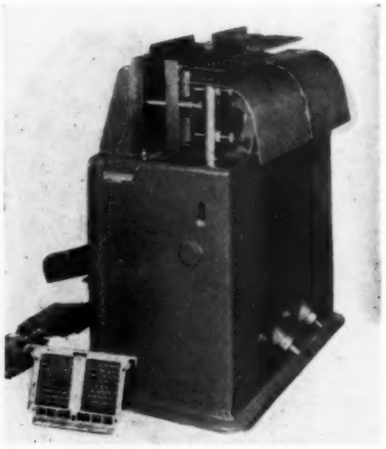
Work is mounted with the axis in a vertical position, between centers, and the work is fed away from the operator, passing between the two cross-axis cutters. The latter are pre-set to the correct center distance for finishing the gears to exact size. At the end of the stroke, the feed reverses and returns the work through the cutters to the starting position. Machine then stops automatically for reloading. Entire cycle is automatic and is controlled with a pushbutton.

Rate of feed of the work through the cutters, as well as number of revolutions per minute of the work and cutters are adjustable by means of change gears to suit particular requirements. Machines are provided with feed and speed charts to facilitate setting up individual jobs. Both cutters may be used for finishing the same gear, if desired, thereby providing faster finishing of individual gears. Cutting oil pump and tank of this machine are made in several sections and are built into the base of the machine. Guards with hinged doors are provided on the machine to prevent splashing of coolant.



Howe Automatic Plate-Caster

Although designed primarily as a battery grid casting machine, this automatic plate caster announced by Howe Machinery Co., Inc., 30 Gregory Ave., Passaic, N. J., can be used for casting practically any small product made of lead. It is claimed that one man can turn out 12,000 single grids in 8 hrs. Machine is powered with a ½ hp. motor driving through a heavy-duty, worm gear speed reducer. Guards are attached to the molds to keep lead drippings from entering the mechanism.

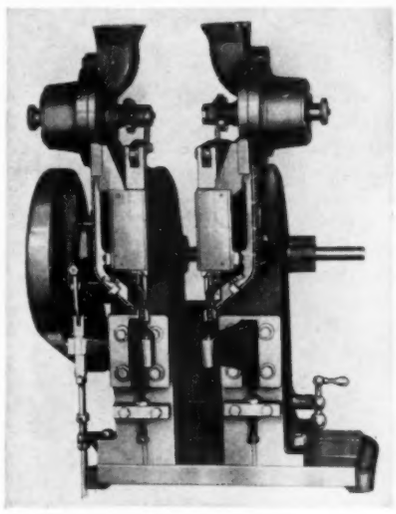


Lead is poured into the molds by hand, the lead pot being set directly in front of the machine for the convenience of the operator. Two molds are mounted side by side and while one mold is being poured the opposite mold opens and knocks out the finished casting. Molds close under spring pressure to eliminate any possibility of foreign matter scoring the cavity. Pressure can be adjusted by nuts located in front of the machine. Finished castings drop through a chute into a receptacle on the floor, and the container is removed from the rear.

Chicago Type 55 Rivet Setter

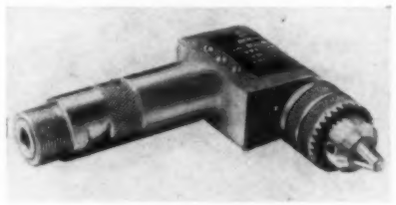
Designed for bench mounting, the Type 55 double head, adjustable center, rivet setting machine offered by Chicago Rivet & Machine Co., 1832 S. 54th Ave., Chicago, Ill., is claimed to be suitable for automatic riveting in smaller assemblies employing rivets having a body diameter up to $\frac{1}{8}$ in. Heads may be operated simultaneously to set two rivets at a time, or the feed on either head may be locked to permit single rivet setting where desirable.

One head remains stationary, while the other is adjustable in or out by means of a lead screw. A single $\frac{1}{4}$ hp. motor is employed in the drive and a single clutch operates the plunger, providing uniform rivet insertion and closure. A safety, non-repeating type clutch mechanism is employed as is an extension trip rod and floor trip treadle.



Stow Series 420 Shaft Angle-Head

Designed for drilling and filing in close quarters on flexible shafts, the Series 420 close corner angle-head announced by Stow Mfg. Co., Inc., Binghamton, N. Y., regularly is furnished with a $\frac{1}{4}$-in. capacity chuck for drills, rotary files, rasps, mounted wheels and mounted points. This head is recommended for use with Nos. 1A, 2A, and 3A flexible shafts.



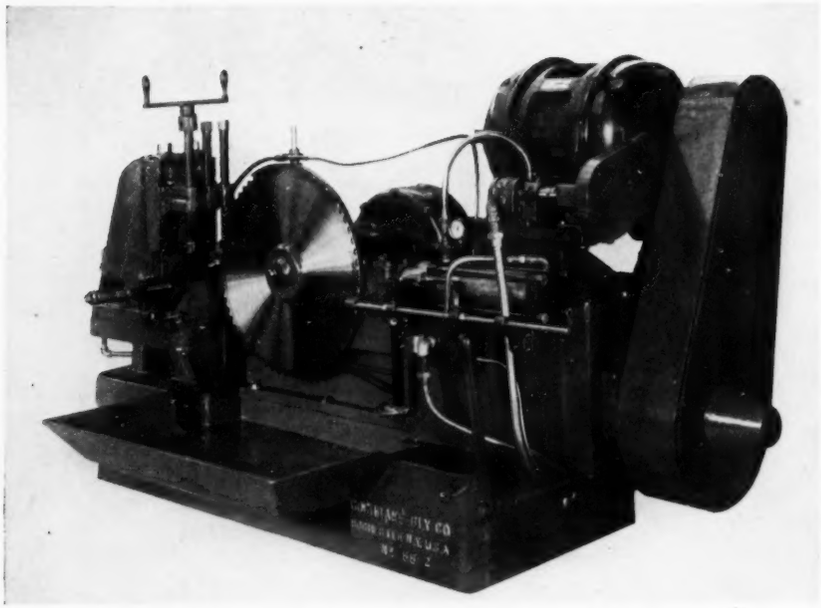
Southwark Tilting-Head Hydraulic Molding Press

Top head of the improved high-speed Southwark hydraulic tilting-head molding press, offered by Baldwin-Southwark Corp., Philadelphia, Pa., is balanced and pivoted so as to move only in a horizontal plane, thus eliminating shock and permitting the use of larger molds. As the press is opened, the head moves back horizontally, at the same time rotating through an arc of 90 deg. and exposing both halves of the mold. Consequently, the main ram is stroked only a few inches in each cycle. Since both halves of the mold are brought into the open, cleaning, insert placing, filling and removal of finished pieces are said to be simplified.

This press is available with adjustable ejectors in either top or bottom platens, or in both. The main cylinder is gland-packed, and design is said to be such that all packings are readily accessible for replacement. Press power is obtained by means of a single ram and the platen is guided to insure parallel surfaces between the upper head and the moving platen. Two pushback cylinders are used to return the platin. Press is of all steel construction, side stanchions, moving platens and similar parts being of cast steel. Trunnion bearings are bushed with centrifugal cast bronze. Pushback cylinders are of hydraulic bronze with stainless steel rams. Mold shown has 75 cavities and is capable of producing 2,250 phenol molded pieces per hour.

Cochrane-Bly 9-In. Brass Billet Saw

Developed for sawing billets, tubes and bars of aluminum, bronze and other non-ferrous alloys up to 9-in. in diameter, this billet saw offered by Cochrane-Bly Co., 15 St. James St., Rochester, N. Y., is driven through a multiple disk clutch and hardened steel gears, all running in oil. Drive shafts, including the saw spindle, are mounted in anti-friction roller bearings. Machine has a sliding gear transmission, giving four cutting



speeds of approximately 250, 370, 485 and 600 ft. per min. Hydraulic feeds ranging from 0 to 100 in. per min. are provided by a self-contained hydraulic pump unit. Adjustable stops in both directions give automatic trip and rapid traverse return of the carriage. A compound toggle, hydraulically-operated clamp having two adjustable clamp screws is provided for holding the work.

A large chip pan with sloping sides for easy removal of chips by means of hoe or shovel is provided in the base of the machine. Billets received from the crane or loading table are placed in a heavy steel feed trough. Chain and sprocket operating under the trough feed the billet into the machine to the cutting position. A special 30-in. diameter blade is used, and it is claimed that this machine will cut a 7-in. diameter brass or aluminum billet in 5 sec. Net weight of machine is approximately 9,500 lb. Floor space required, 64x114¼ in.

Type PR straightening presses, available with short or long tables, are made in capacities ranging from 25 to 200 tons and with strokes of 12 to 20 in. Net weight ranges

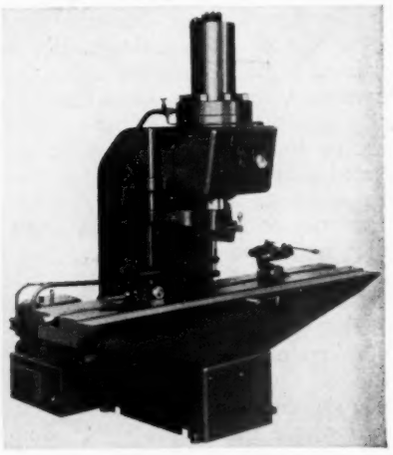


Fig. 2—A 96-in. table is fitted to this 75-ton Type PR Oilgear gooseneck straightening press. A sliding ram nose and spring centers on roller carriages are fitted to this unit

from 5,900 to 20,000 lb. A 75-ton straightening press of this type equipped with a 96-in. long table, sliding ram nose and spring centers on roller carriages is shown in Fig. 2. Convenient hand lever and pedal control enables the operator to select the down and return ram speeds independently, to vary the ram speeds at will and to reverse or stop ram movement at any time. Ram stroke

Oilgear Hydraulic Presses

Featuring variable ram speed, sensitive control, as well as a wide range of sizes, a line of gooseneck, straightening and sideplate hydraulic presses have been announced by The Oilgear Co., 1319 W. Bruce St., Milwaukee, Wis. Type PG and PGR gooseneck presses, suitable for forcing, broaching, assembling, and straightening operations, are complete, self-contained units. Two sizes of Type DH variable displacement pumps are available for each size of these presses. One provides economical variable ram speeds for general manufacturing purposes and the other higher variable ram speeds for increased production requirements. These presses have all-steel welded frames with integral pump and motor base, together with a ring-type piston fitted to a hat-type steel cylinder. Automatic protection against overload is provided. Type PG presses have plain platens of convenient working heights. They range in total height from 105½ in for the 6-ton press to 116 in. for the 25-ton unit. Type PGR gooseneck presses, Fig. 1, have low platens and large daylight openings, suitable for detachable tables and fixtures. Spacer tables, work tables and straightening tables of various working heights, widths and lengths can be furnished for use with these presses.

Fig. 1—This 25-ton capacity Type PGR Oilgear gooseneck press has a detachable work table

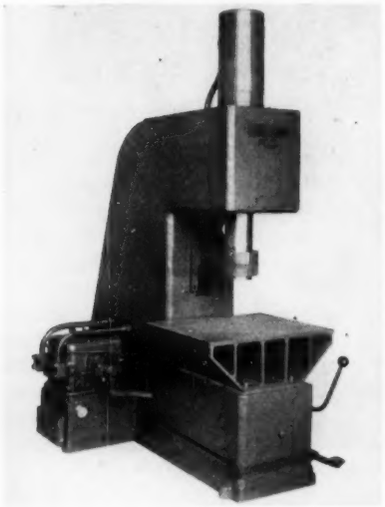
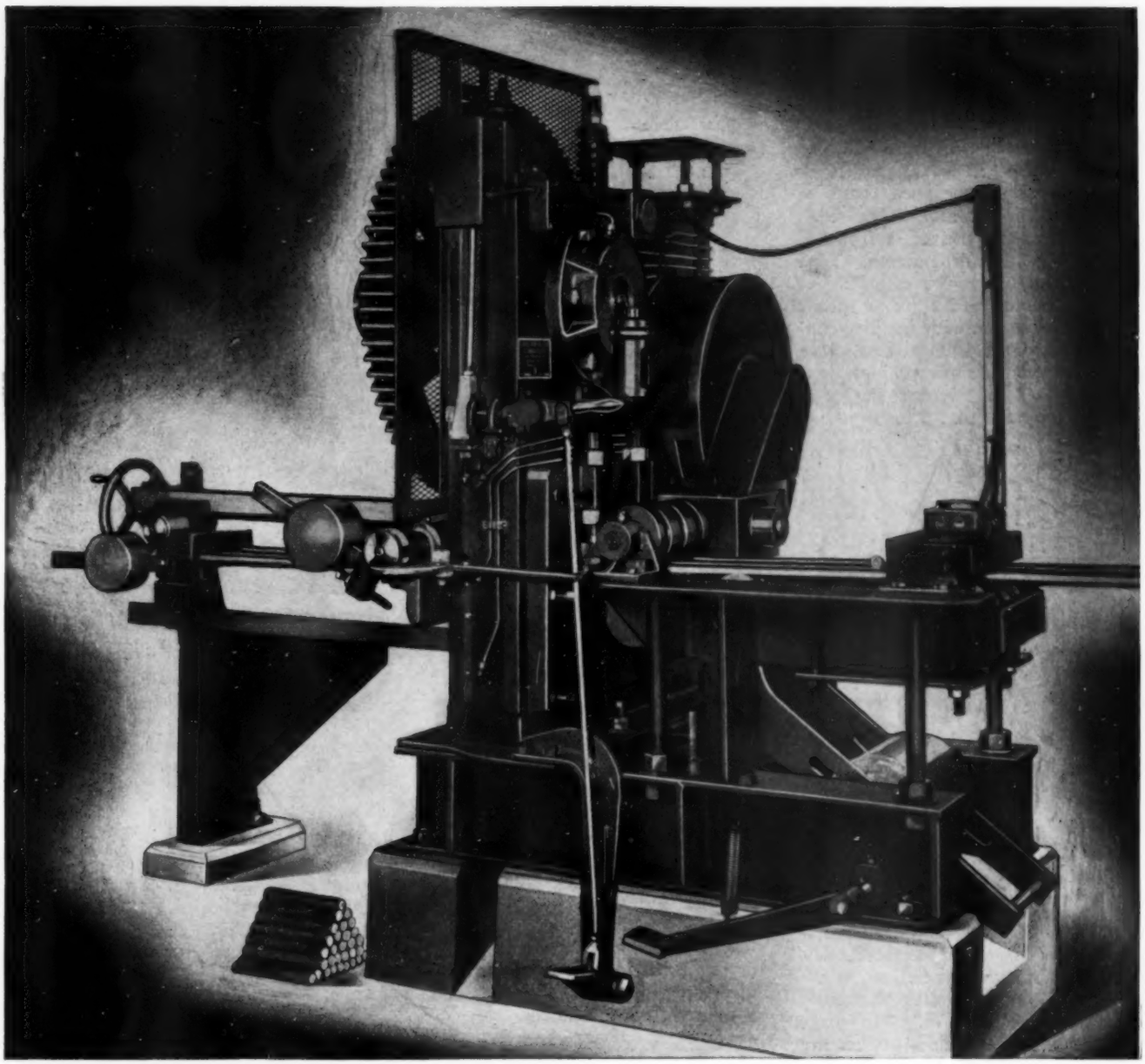


Fig. 3—Oilgear 10-ton capacity sideplate press, available either with constant or variable ram speed



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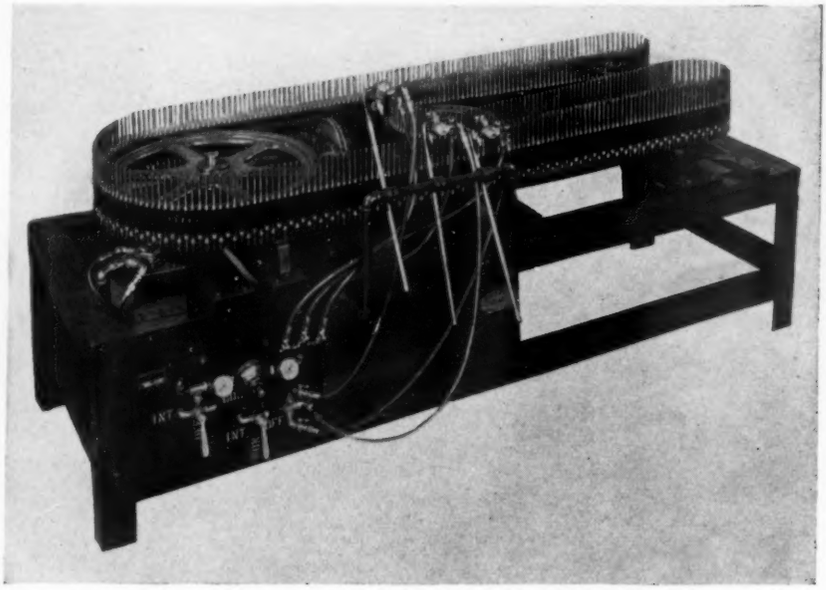
can be pre-set or selected at will.

Fig. 3 shows a standard 10-ton sideplate hydraulic press having fully inclosed operating mechanism. Oil and lubricant reservoirs are built in. Presses of this type are available as constant ram speed, Type PEC, or variable ram speed, Type PED, units. Double ram speed return is provided for on the Type PEC presses through use of a Type C constant displacement pump. Type DH 2-way variable displacement pumps provide variable ram speeds in either direction with sensitive control for the Type PED presses. Both types are available in capacities ranging from 3 to 15 tons and with strokes ranging from 6 to 30 in.



B. & S. No. 824 Magnetic Chuck

Brown & Sharpe Mfg. Co., Providence, R. I., offers the No. 824 permanent magnet type chuck in addition to the two sizes previously described (*AM*—Vol. 81, page 864). This chuck does not require electric current, all electrical connections, wires, switches and auxiliary generators being eliminated. Magnets are of a special alloy and are claimed to last indefinitely. Working surface and base are ground parallel and two removable stop plates are provided, one for the back and one for the left-hand end. These stop plates are adjustable vertically.

A new adapter plate, No. 824A is offered for use with this chuck. This adapter plate, through the use of narrow steel strips with narrow non-magnetic brass spacing strips, holds readily pieces too small to be held on the regular surface of the magnetic chuck. Working surface of the chuck is $8\frac{3}{8}$ x $27\frac{7}{16}$ in. and the magnetic surfaces measures approximately $6\frac{5}{16}$ x $9\frac{3}{4}$ in. Height of chuck is $3\frac{3}{4}$ in. No. 824A adapter plate is $9\frac{9}{16}$ in long, $5\frac{1}{2}$ in. wide, and $\frac{33}{32}$ in. thick. It will hold work $\frac{5}{16}$ in. in diameter and $\frac{1}{16}$ in. thick.

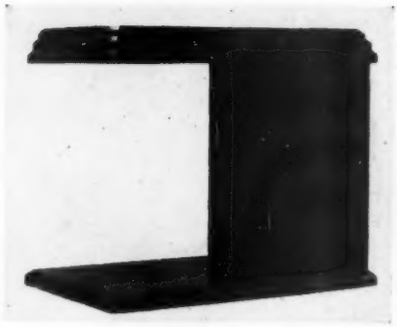
"Spraco" Automatic Finishing Machine

As many as three finishing operations and complete drying can be done automatically and continuously with the "Spraco" finishing machine developed by Spray Engineering Co., 165 Central St., Somerville, Mass. Designed specifically for small machine parts, shell work, novelties and similar items, this machine has several hundred vertical spindles which are rotated as they pass through the sprays from the guns. Guns can be adjusted independently to provide complete coverage. Speed of operation is variable to provide proper drying time. In operation, the complete unit is inclosed by an exhaust hood and drying chamber.

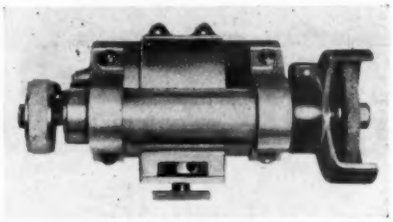
Barkon-Frink Model F Color Matching Lamp

A series of bench model units, listed as Model F lamps, is offered by Barkon-Frink Tube Lighting Corp., 23-10 Bridge Plaza South, Long Island City, N. Y., to supplement the larger Barkon lamps for color matching purposes. These light sources are said to be particularly suitable for use at manufacturing process control points. Units employ carbon-dioxide daylight lamps and it is claimed that the chromaticity of the carbon-dioxide radiation remains unchanged throughout the life of the tube.

Model F Lamps have dimensions of 22 in. length, 12 in. width and 18 in. height. The 25 mm. tubing, which forms the grid is mounted on a white porcelain enameled reflector to provide diffused and glareless illumination. Entire unit is mounted



in a steel case. Auxiliary transformer equipment is mounted in a separate cabinet and can be located at a convenient spot. Three sizes are available with capacities ranging from 40 to 125 ft.-candles illumination.



Themac Type J-24 Toolpost Grinder

Designed for precision grinding on any size lathe, the Type J-2A toolpost grinder offered by The McGonegal Mfg. Co., 228 Orchard St., East Rutherford, N. J., ordinarily is furnished with a wheel guard for external grinding. For internal grinding, a $2\frac{3}{4}$ in. extension spindle is furnished. Grinding speeds of 7,000, 10,500, 25,000 and 36,000 r.p.m. are obtainable with this unit, which is powered with a $\frac{1}{3}$ hp. universal motor having a dynamically balanced

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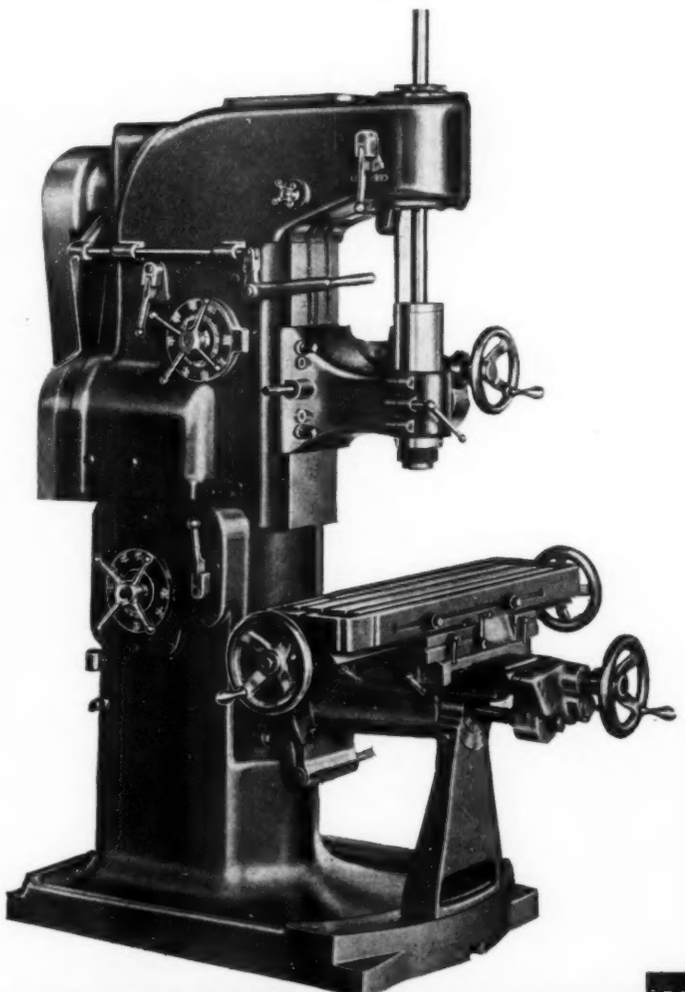

• Here, in addition to versatility, accuracy, and power, is a fast machine. Set-ups, particularly the difficult ones, can be quickly made and additional set-ups often eliminated or if necessary greatly simplified. Another speed advantage is the quick and accurate location of holes and surfaces. You can change vertical settings quickly too—simply move the spindle instead of raising or lowering the work. Also there is the Knight fast method of changing cutting tools.

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armature mounted in ball bearings. Distance from center of spindle to center of T-slot is $2\frac{1}{8}$ in. minimum and $2\frac{15}{16}$ in. maximum. Complete unit weighs $10\frac{1}{2}$ lb.

M.S.A. One-Hour Oxygen Apparatus

Complete respiratory protection in any atmosphere for at least one hour, under severe working conditions, is claimed for the "Lightweight" one-hour oxygen breathing apparatus manufactured by Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh, Pa. Weighing only 18 lb., this unit is compact, carries comfortably and is claimed to

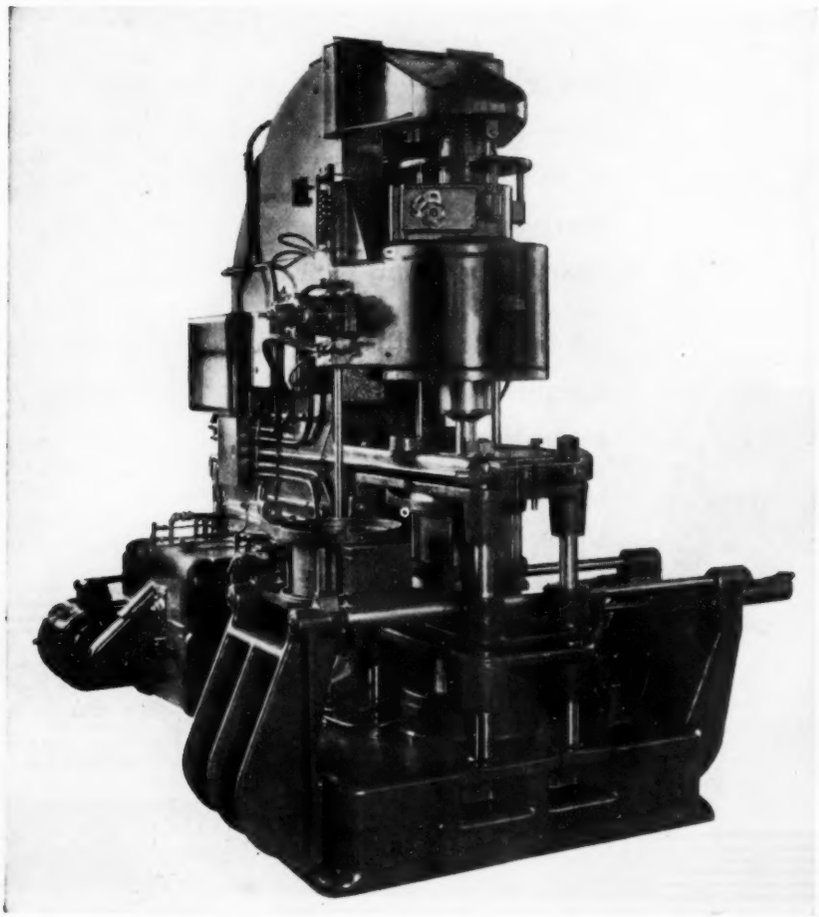
be positive and fully automatic in supplying the required amount of oxygen. Mouthpiece type is officially approved by the U. S. Bureau of Mines and is furnished complete with a skull cap and a pair of gas-tight, non-fogging goggles. Both the nose-clip and mouthpiece are quickly adjusted. A facepiece type is available where complete protection of the face is desired, as in fire-fighting service.

Fitchburg Vertical Planetary-Type Full-Automatic Internal Grinder

Originally developed for grinding electric motor stator cores, this vertical planetary-type, full-automatic closed cycle internal grinder announced by Fitchburg Grinding Machine Corp., 76 Winter St., Fitchburg, Mass., utilizes electro-hydraulic control throughout. Sequence of movement is interlocked so that one motion cannot be operated unless the previous one has been performed. Operator's only duty is to see that the work is properly located in the loader and to trip the control.

Cycle is automatic from loading, work clamping, grinding, sizing, through to unloading. Wheel head is equipped with anti-friction bearings in all three movements. Speed of the assembly rotation is controlled by a hydraulic oil motor with variable speeds. Eccentric has $1\frac{1}{2}$ in. movement on the radius, allowing for 3 in. wheel wear on the diameter. Wheel spindle is driven by a 3 hp., 3,600 r.p.m. motor. Speed changes are taken care of by pick-off pulleys. Belt slack, due to the eccentricity, is taken up by an adjustable motor frame and connecting rod on the eccentric spindle. Entire spindle assembly is mounted as a unit for vertical reciprocation.

Hydraulic control is contained in one unit, including the tank. In this, there are four oil circuits driven by two dual pumps with a 5 hp., 1,800 r.p.m. motor. One circuit has a balancing control to act as a counterweight for the vertical reciprocation of the wheel head. Fixture is, of course, dependent on the work to be done and may or may not be hydraulically operated. The one shown is arranged for holding motor stators and locates by means of the counterbores on the ends of the frames. It has a hydraulic ram with ring compressors for holding the laminated cores under heavy pressure. Base and column of the machine are of box section. Total weight is approximately 16,000 lb.

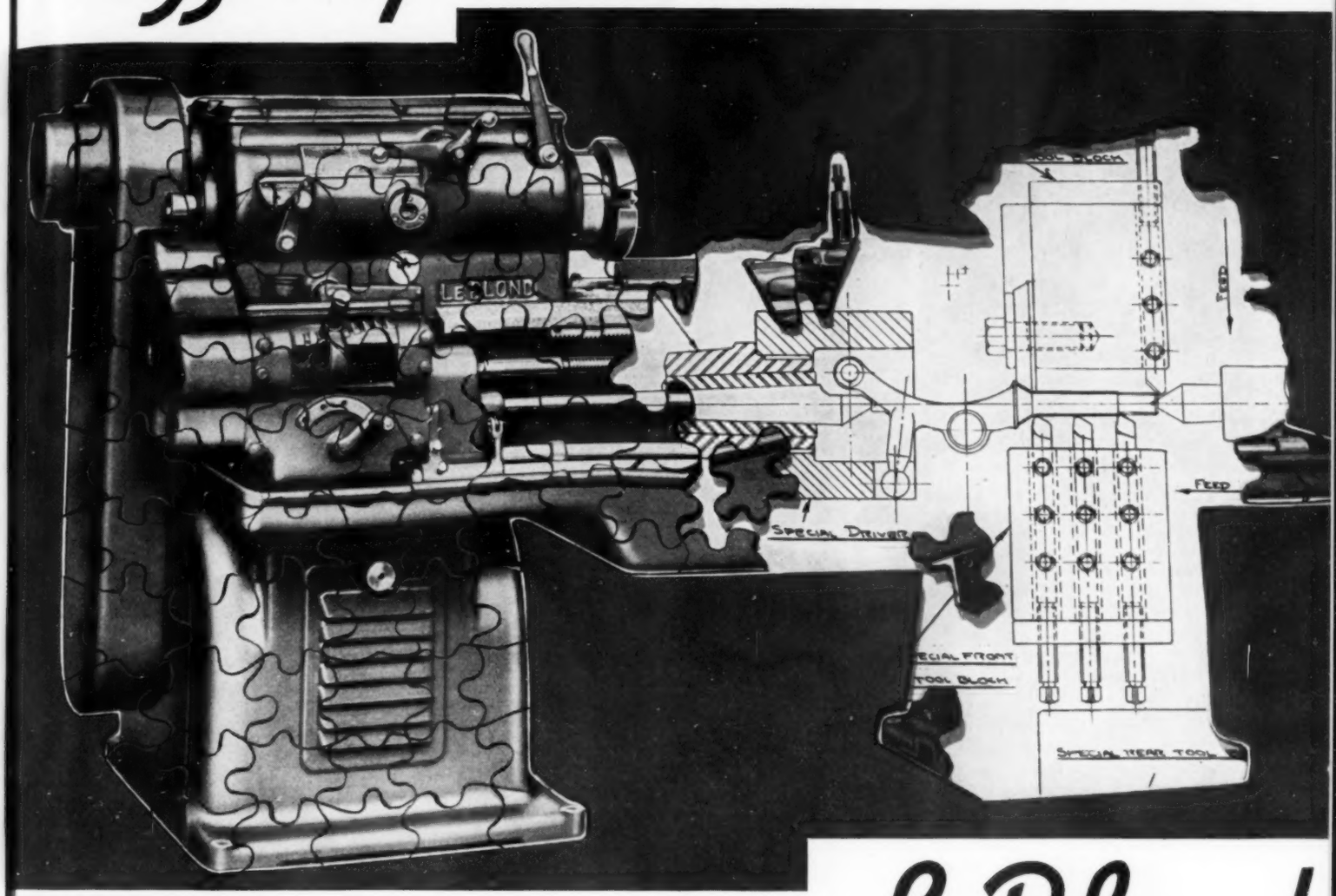


Dremel "Moto-Tool" Model 2 Grinder

Equipped with a shock-proof bakelite housing and balanced for smooth running, the Model 2 Moto-Tool announced by Dremel Mfg. Co., 14th and Clark Sts., Racine, Wis., weighs 13 oz. and has a spindle speed of approximately 27,000 r.p.m. Outside diameter is $1\frac{11}{16}$ in. and over-all length is $6\frac{5}{8}$ in. over chuck. A wrenchless-type chuck is used, a small pressure on the lock pin being sufficient to hold the chuck firm when unscrewing the sleeve. Motor is of the universal type, operating on 110 volts a.c. or

Fig. 1—Dremel Model 2 "Moto-Tool" can be used for grinding, drilling, polishing and routing on a wide variety of materials

Puzzling Production Problems



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THE R. K. LeBLOND MACHINE TOOL CO.

Dept. H-6

CINCINNATI, OHIO

Fig. 2—Both hands are free to manipulate a job over the grinding wheel when the "Moto-Tool" is mounted in this universal stand. Tool can be tipped to any angle by means of a ball joint, which is fastened with a wing nut

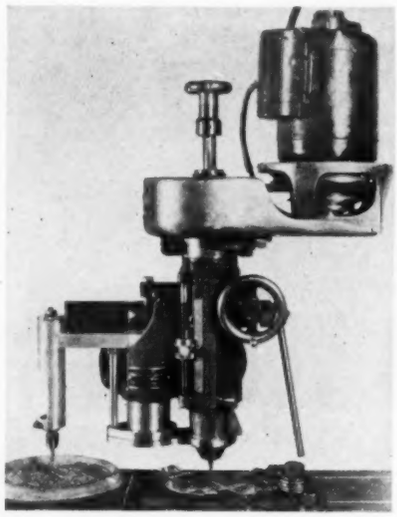
d.c. Sliding snap-type switch is mounted in the housing. Finger grip is an integral part of the body of the machine and close to the working tool. Machine can be held close to the chuck. This tool is adaptable for work on most materials in manufacturing plants, toolrooms and laboratories. It is claimed to run cool under continuous use.

Niagara Series KL Squaring Shears

Niagara Machine and Tool Works, 637-697 Northland Ave., Buffalo, N. Y., has announced the addition of a line of Series KL Power Squaring Shears in 6, 8, 10½ and 12 ft. lengths for flat shearing ⅜-in. steel. In addition, 14- and 16-ft. machines are available for shearing ¼-in. steel. Triangular section crossheads with low slope, a box section bed and an inclosed drive running in oil are features of the design of these machines. Gears are mounted on antifriction bearings. The 14-point engagement sleeve clutch has a built-in single stroke mechanism. Self-measuring parallel back gage is equipped with ball bearings.

Universal "Hydra-Speed" Milling Duplicator

Universal High Speed Tool Co., 549 W. Washington Blvd., Chicago, Ill., offers the "Hydra-Speed" duplicating attachment for contour milling. This unit is adaptable to any Model

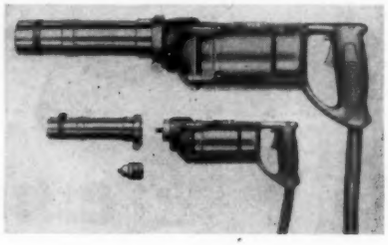


4-H "Eklind" universal milling, drilling and boring head, or the duplicator may be purchased mounted on the milling head. Instant and smooth vertical motion is said to be imparted hydraulically to the milling head cutter spindle at the rate required to follow the contour of the model or templet.

A small amount of pressure on the tracer tip actuates a sensitive hydraulic valve to operate the cutter spindle, thus making it possible to use soft wood or plaster models. Both hands of the operator are free to feed the table in any direction. Cutter is not allowed to feed deeper than the point where the tracer touches the model. When the tracer is not in contact with the model, there is a steady downward feed to the cutter quill. Accurate graduated depth stops on the milling head may be set at any point in the 4-in. stroke of the quill, as a positive depth limit. The duplicator includes a 20-gal. oil tank, motor and pump mounted on rollers.

CP No. 200-2700 Combination Drill

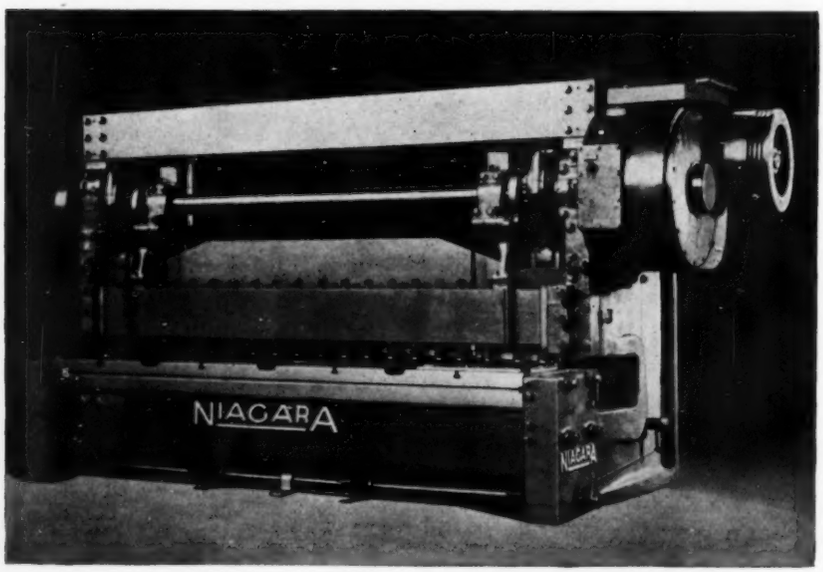
No. 200-2700 combination electric drill and hammer drill, announced by Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y., consists of a $\frac{5}{16}$-in. capacity, heavy-duty uni-



versal electric drill than can be converted to a self-rotating hammer drill of ½ in. capacity in concrete, brick and stone. It can be used for light chipping by applying a lock collar to stop rotation. Over-all length is 18 in. and net weight is 11½ lb.

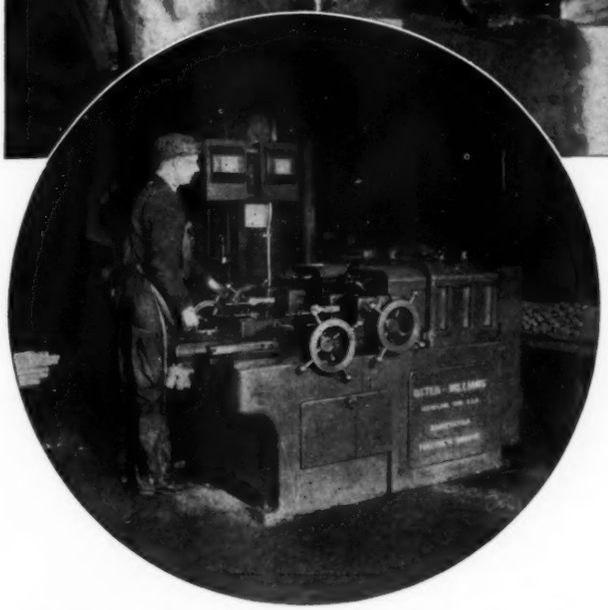
Rogers Type CC-3 Knife Grinder

Slitter knives and solid or split circular disks ranging from 2 to 20 in. in diameter can be ground on the Type CC-3 grinder offered by Samuel C. Rogers & Co., 191 Dutton Ave., Buffalo, N. Y. Any thickness of disk with single or double bevel or flat face can be ground. In this machine the knife is held on an interchangeable arbor fastened in the drive spindle. This spindle is driven by a V-belt, with a sheave of variable pitch, adjustable to proper cir-



MAKING GOOD WHEREVER INSTALLED

Salvaging rusted bolts in large midwestern railway shop



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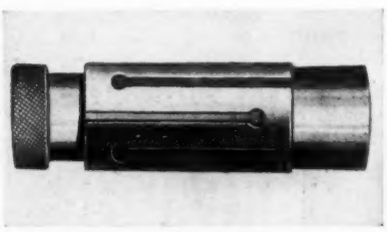
RAPIDUCTION BOLT THREADER

cumferential speed for the diameter of knife being ground. Grinding wheel is driven by a separate motor, which is adjustable in position to give the necessary working range for different diameter knives.

Triple-slide provides adjustment to meet requirements of circular grinding, whether single or double bevel of any degree. A motor-driven wet grinding attachment with suitable splash guards is provided. Regular equipment includes one ⅓ hp., 3,600 r.p.m. motor for driving the grinding wheel, and one ⅓ hp., 1700 r.p.m. motor for driving the knife spindle and water pump. Approximate shipping weight of the machine is 850 lb. It requires 30 x 34 in. floor space and is 57 in. high.

C & W Expanding Line-Reamer Pilot

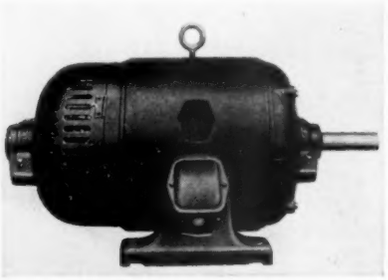
Consisting of two parts, a tapered arbor and a slotted sleeve with a corresponding internal taper, the expanding pilot offered by C & W Tool Co., Div. Perfection Marker & Die Co., 19 Chestnut St., Cambridge, Mass., now is available with all C & W line reamers. In operation, the sleeve is moved on the arbor until the desired diameter is obtained, or until the pilot engages its bearing firmly.



Wagner Type RT Polyphase Motor

Designed to give comparatively low starting current, high starting torque and good speed regulations, the Type RT polyphase motor announced by Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo., has a locked torque of approximately twice full load torque. In this motor, the rotor is the primary member and carries a winding which is connected to the line when the motor is operating. Stator has two windings, one of which has a high-resistance, short-circuited winding and the other a low resistance insulated winding.

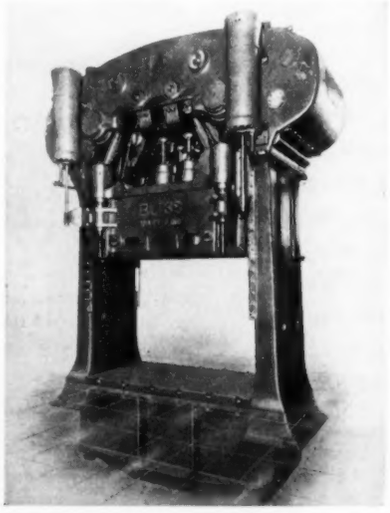
Available in a wide variety of ratings, but ordinarily built only in 48 hp. and larger sizes, this motor is claimed to be particularly suitable for use in those localities where double squirrel-cage motors of larger sizes produce undesirable voltage variations.

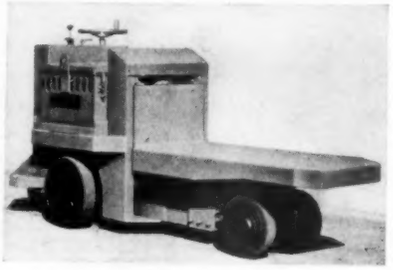


Bliss No. 4-CT-12-180 Toggle Press

E. W. Bliss Co., 53rd St., and 2nd Ave., Brooklyn, N. Y., offers the No. 4-CT-12-180 four-point toggle press, designed for drawing large auto-body panels. It also is suitable for drawing one-piece steel tops for automobiles and can be converted to single-action operation for blanking work. The six "Hydro-Pneumatic" cushions in the bed, having a capacity of 200 tons, when used in conjunction with the press operating for double action, give triple action results. Press measures 180 in. between uprights and area of the 8-in. thick bolster plate is 100 in. front to back by 180 in. right to left. It has two crankshafts running front to back, having a diameter of 12 in. at the bearings and 16 in. at the crankpins. Drive is by means of a two-speed 25 hp. motor, giving press speeds of 3½ and 5 strokes per min.

Clutch is of the multiple-disk, pneumatic friction type controlled by electric palm buttons. Press may be inched for die setting. A central control panel is arranged to give several optional methods of operation by the turn of a switch. Specifications: plunger stroke, 44 in.; shutheight, plunger to bed, 98 in.; adjustment of stroke, 25 in.; area of plunger, front to back by right to left, 79 x 161 in.; stroke of blankholder, 36 in.; shutheight, blankholder, to bed, 88 in.; adjustment of blank holder, 25 in.; the long adjustments, permit the use of either high or low dies as required.

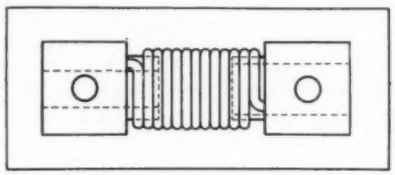




Mercury Low-Lift Platform Truck

Of 6,000 lb. capacity, the Model A-1020-28 low-lift elevating platform truck offered by The Mercury Mfg. Co., 4118 S. Halsted St., Chicago, Ill., has a platform 27 in. wide by 66 in. long. This platform can be lowered to a height of 18 in. and raised to a maximum height of 24 in. above the ground. Trail axle wheels are 15 x 5 in. and the drive wheels are 20 x 5 in., all rubber tired. Drive axle is of the double-reduction spiral bevel and spur gear type.

Steering is of the horizontally disposed wheel type with a Ross gear at the base of the vertical steering shaft. A snap-action contactor controller provides three travel speeds forward and reverse. Platform elevation is accomplished by the hydraulic method. Battery power assembly is housed in a demountable box compartment, permitting quick removal and replacement. A gas-electric unit can be used in place of the battery.



"Triple-S" Coupling

Four sizes of "Triple-S" flexible couplings have been announced by Specialty Sales and Service Corp., 138 Holden St., Minneapolis, Minn. In these couplings, a torsional spring picks up the load from the motor on starting and regulates the driving force as the driven member picks up speed. Extension end sections are of cadmium plated steel. Standard stock end members have $\frac{5}{16}$, $\frac{3}{8}$, $\frac{7}{16}$ and $\frac{1}{2}$ in. diameter holes. Couplings range from 2 to 5 in. in over-all lengths.

Binks Respirators

Two industrial-type respirators have been announced by Binks Mfg. Co., 3114–26 Carroll Ave. Chicago, Ill. The No. 7 respirator, shown in Fig. 1, is a twin-cartridge type that is claimed to be easy to put on and adjust. It fits the face with fume-tight seal and permits full vision and unhampered working. Use of two filter cartridges is claimed to reduce breathing resistance and to remove paint vapors and pigments thoroughly.

Fig. 1—Twin-cartridge Type No. 7 Binks respirator is easy to put on and permits full vision

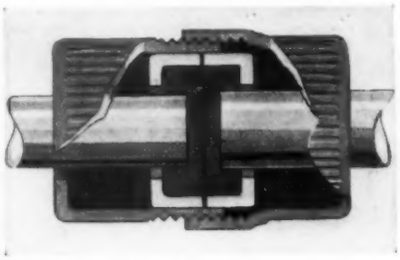
Especially adapted to overhead and outdoor paint spray work, the No. 686 helmet-type respirator shown in

Fig. 2—Binks No. 686 paint spray mask is adapted for over-head work and protects head, neck and shoulders of the workman

Fig. 2 protects the workman's head, neck and shoulders. This unit is claimed to be light in weight and easy to wear. Muslin hood is attached to the cap and fits snugly over the shoulders. Large pyralin window is easy to clean. Cap has air connection at back and by taking off a T connection at the air connection to the spray gun, and using an adjusting valve, a small amount of air can be brought into the helmet.

Gordon "Torflex" Flexible Couplings

"Torflex" flexible couplings announced by the Gordon Engineering Co., 3576 Gratiot Ave., Detroit, Mich., transmit power from the driving to the driven shaft through rubber bushings which are bound by pressure to the shaft by means of six simple parts. The two-point design is said to allow maximum angular and parallel misalignment of the shaft. Four types are available with ratings ranging up to 650 in. lb. maximum torque. Maximum shaft diameter is $1\frac{1}{2}$ in.



Westinghouse Offers Vertical Gearmotors

Gearmotors, marketed by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., now are available for vertical application. Unit shown is a 5 hp. model, designed to operate at 587 r.p.m. These units are drip-proof and employ a special 1,760 r.p.m. motor combined with heat-treated alloy steel, single helical gears, and anti-friction bearings. An efficiency of 88 per cent is claimed.

Landis Style CBLM Collapsible Tap

Employing a circular-type chaser, the Style CBLM receding chaser collapsible tap announced by The Landis Machine Co., Inc., Waynesboro,

Pa., can be used for tapping couplings made from seamless or welded steel or wrought iron. Head of tap is a self-contained unit which is detachable from the body.

The standard No. 6 CBLM body can be fitted with 4, 4½, 5, 6, 7, 8, 9, 10, 11 and 12 in. heads. covering a thread range from 4½ in. to 13⅜ in. outside diameter. Standard body will cut an actual thread length of 5⅝ in., as required for A.P.I. couplings.

Construction of the tap is simple, with no small parts. In operation, the tap is expanded by a short movement of the crank handle, operating through a rack and pinion, to bring the tripping ring into contact with the face of the coupling. This brings into operation the receding mechanism as the tap is fed into the coupling. Crank handle controls the manual movement of the housing and is fitted with a latch so that the housing and trip ring can be moved back and locked out of the way to provide access for replacing the chaser slides. Adjustment is provided for thread length, so that the tap collapses automatically at any predetermined length. Cam which operates the receding action is arranged for cutting the regular tapers of $\frac{3}{16}$, $\frac{3}{8}$ and $\frac{3}{4}$ in. per ft. and is provided with an adjustment for any desired variation of these tapers.

FIRTH-STERLING
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CATALOG
This 118 page Firth-Sterling loose leaf tool steel catalog, indexed into six divisions covering High Speed and Hot Work Steels — Tool and Die Steels — Stainless Steels — Cold Drawn Steels and Sintered Tungsten Carbides, gives the analyses of our tool and Stainless Steels, with the heat treatments and physical properties, prices and classification of extras. It also contains much technical data of value to every user of tool steels and sintered tungsten carbides. This catalog is offered without any obligation. Write for your copy at once.
FIRTH-STERLING
STEEL COMPANY

Udylite Nickel-Plating Process

A bright-nickel plating process developed by The Udylite Co., 1651 E. Grand Blvd., Detroit, Mich., is claimed to adhere well and not to flake, chip or peel. No activation is required prior to chromium plating. The solution is said to be a stable, easily-controlled bath having good throwing power. Highly lustrous nickel deposits are obtained over a wide range of plating conditions.

Among the advantages claimed for this process are the elimination of most, if not all, buffing, tumbling and coloring operations to give the nickel coating the proper lustre before the final chromium plated finish. Copper buffing prior to nickel plating is eliminated. Nickel deposits are secured in deep, inaccessible recesses, permitting economic finishing of parts of irregular shape. Parts plated on wire or certain simple racks may be taken directly from the nickel to the chromium plating bath without buffing, handling or re-racking.

TRADE PUBLICATIONS

ASSEMBLY SERVICE Facilities for designing, machining, testing and assembling electrical and other products are discussed in a folder offered by Hunter Pressed Steel Co., Lansdale, Pa.

BEARINGS "Oilite" oil-cushion bronze bearings are discussed and listed in a 16-page bulletin, Form No. 1-38, offered by Boston Gear Works, Inc., North Quincy, Mass.

BEARINGS "Your 10 Demandments" is the title of a 22-page bulletin discussing features of Hyatt roller bearings, offered by Hyatt Bearings Div., General Motors Corp., Newark, N. J.

BLOWERS Bulletin No. 21-B-19, offered by Roots-Connersville Blower Corp., Connersville, Ind., describes Victor-Acme rotary positive blowers for pressures or vacuums.

CABLE Physical and electrical properties and applications of varnished-cambric cable are discussed in a 36-page bulletin publication No. C-41, announced by Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.

CLUTCHES A 10-page catalog discussing Johnson friction clutches and tabulating general specifications for Model SJ clutches has been announced by The Carlyle Johnson Machine Co., 52 Main St., Manchester, Conn.

COMBUSTION "Flame-otrol" units for combustion control are discussed in a 12-page bulletin, No. 1102, published by Wheelco Instruments Co., 1929 S. Halsted St., Chicago, Ill.

COUNTERBORE A bulletin offered by the Eclipse Counterbore Co., 7410–30 St. Aubin Ave., Detroit, Mich., describes features of radial-drive counterbores. In these tools, two integral radial drives directly on the line of center eliminate screws, pins and springs in the assembly of the counterbore.

FIRE PROTECTION Inspected fire protection appliances, as of January, 1938, are listed in a bulletin offered by Underwriters' Laboratories, Inc., 161 Sixth Ave., New York, N. Y.

GAGES A 28-page booklet entitled "The L. P. Handbook of Gages" has been offered by Lincoln Park Tool and Gage Co., Lincoln Park, Mich. The first section of this bulletin is devoted to gages and precision tools manufactured by this company, while the entire second section discusses the gage standards prepared by the American Gage Design Committee.

GOGGLES A chart which specifies types of safety goggles suitable for protection against eye hazards in various industrial operations has been compiled by the Safety Engineering Div., American Optical Co., Southbridge, Mass.

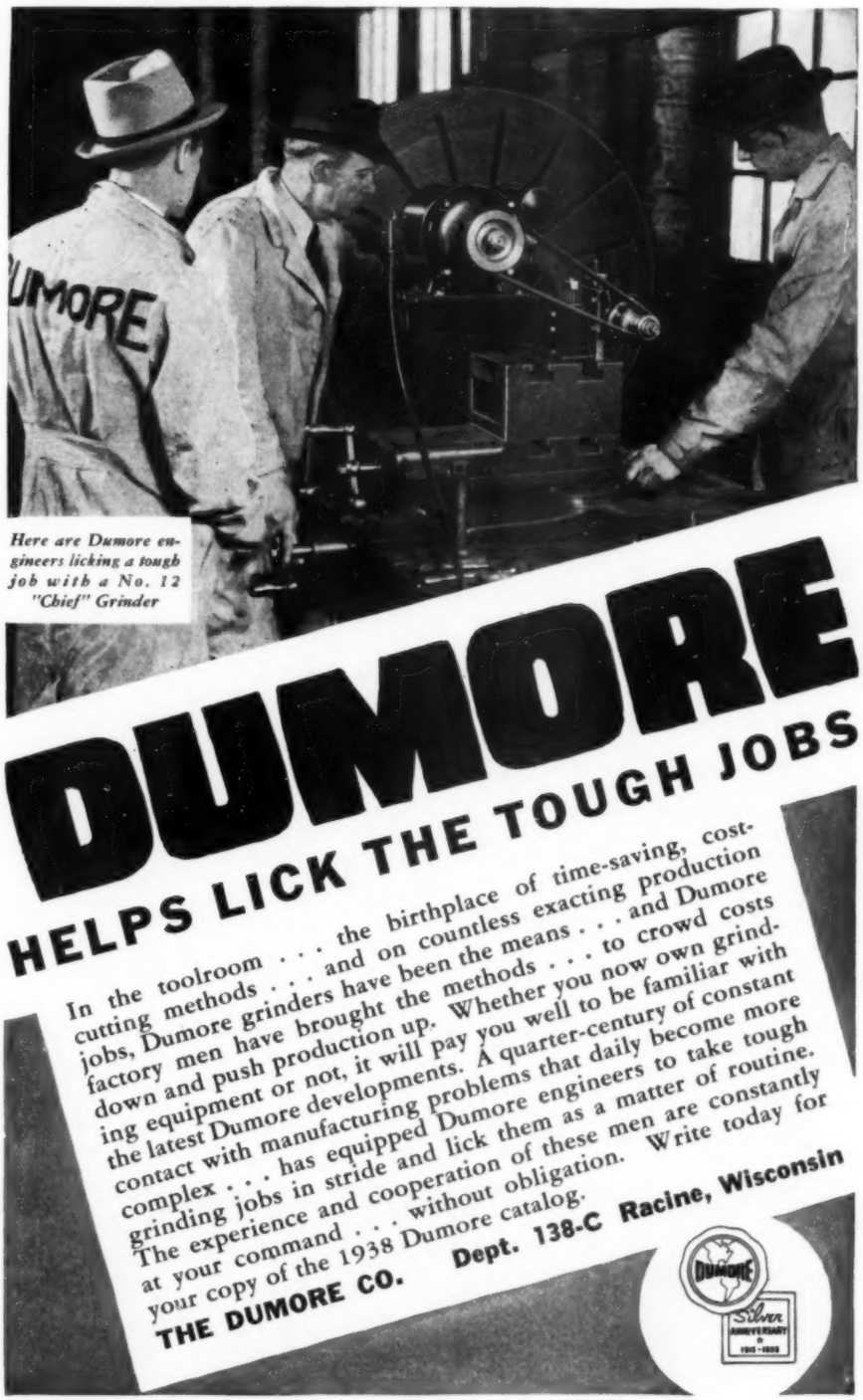
GRINDING A folder describing the "Universal" grinding fixture has been published by Putnam Tool Co., 2981 Charlevoix Ave., Detroit, Mich.

GUIDANCE "Finding Your Work" is the title of a 64-page, paper-bound booklet written by J. Gustave White, Professor of Applied Psychology, Whittier College, Whittier, Calif. The author discusses vocational guidance counseling, how such counseling helps and pitfalls to be avoided. Copies can be obtained from Association Press, 347 Madison Ave., New York, N. Y., at a price of 35 cents each.

HANNA PRODUCTS Catalog No. 226, covering the line of cylinders, hoists and valves offered by Hanna Engineering Works, 1765 Elston Ave,. Chicago, Ill., gives information regarding each size and type of unit manufactured.

HEATING GUIDE Publication of the "1938 Heating, Ventilating and Air Conditioning Guide" has been announced by the American Society of Heating and Ventilating Engineers, 51 Madison Ave., New York, N. Y. This official reference book of the Society contains 840 pages of reference data included in 45 chapters covering material on design and specifications of heating, ventilating and air conditioning systems. Price, $5 per copy.

HYGROMETERS Catalog No. 6502, a 28-page bulletin published by The Brown Instrument Co., Wayne and Roberts Aves., Philadelphia, Pa., covers a complete line of recording and controlling hygrometers. Both electrically operated and air-operated humidity controllers are described.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INDUSTRIAL RELATIONS "The Office Library of an Industrial Relations Executive" is the title of a 24-page bulletin announced by the Department of Economics and Social Institutions, Princeton University, Princeton, N. J. Prepared by Helen Baker, assistant director, Industrial Relations Section, this bulletin lists 140 books and pamphlets suggested as a nucleus around which to build an industrial relations library. Price, 25 cents per copy.

LABOR "The Labor Crisis in the United States" is the title of a 30-page, paper-bound booklet written by George E. Sokolsky and published by John Wiley & Sons, Inc., New York, N. Y. The author discusses the problem of how to find an industrial peace that will give the worker adequate representation for collective bargaining and at the same time make it possible for the employer to continue in business. Price, 25 cents per copy.

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LIGHTING "Mercury Light for Better Sight" is the title of a 12-page bulletin, No. 521, announced by General Electric Vapor Lamp Co., Hoboken, N. J. Applications of the Cooper Hewitt-incandescent combination, open-type lighting unit, are discussed.

METAL COATING "Calibron Notebook No. 4," offered by Calibron Products, Inc., 51 Lakeside Ave., West Orange, N. J., deals primarily with the Whitney metal coating process. Present methods of coating metals with metals and a discussion of the diffusion of metals also are contained in this 24-page booklet.

PACKAGING Catalog No. 17, comprising the 5th edition of the "Guide to Better Packing & Shipping Methods," published by Signode Steel Strapping Co., 2600 N. Western Ave., Chicago, Ill., discusses savings in a few of the 350 specific industries where strapping methods are used.

PATTERN PLATES "Sonittep" dow-metal pattern plates are discussed in a 4-page bulletin offered by George F. Pettinos, Inc., 1206 Locust St., Philadelphia, Pa.

PILLOW BLOCKS Self-aligning, ball and socket pillow blocks for heavy-duty service are listed and described in a bulletin offered by Palmer-Bee Co., Detroit, Mich.

PRESSES Bulletins No. 32100, 32200 and 33101, offered by the Oilgear Co., 1319 W. Bruce St., Milwaukee, Wis., describe the features of a line improved gooseneck, straightening and sideplate hydraulic presses suited for a variety of manufacturing operations. Constant or variable ram speeds are available in both directions.

PROVING RINGS Elastic proving rings, suitable for calibrating testing machines are described in a six-page bulletin published by Tinius Olsen Testing Machine Co., 500 N. Twelfth St., Philadelphia, Pa. These rings are equipped with an electrically vibrated reed.

SCREWS A six-page folder offered by American Screw Co., Providence, R. I., discusses the advantages of American "Plus" screws having Phillips recessed heads. Screw drivers and power bits for driving these screws also are shown.

SMALL MOTORS Bulletin No. 1020-A offered by Bodine Electric Co., 2254 W. Ohio St., Chicago, Ill., discusses features of fractional horsepower motors in ratings from 1/2000 to $\frac{1}{6}$ hp.

SPEED INDICATOR Bulletin No. 715, offered by Herman H. Sticht & Co., 27 Park Place, New York, N. Y., describes the "Standco" speed indicator, which combines a revolution counter and surface-speed indicator with a chronometer.

SPRINGS Hunter Pressed Steel Co., Lansdale, Pa., has published a booklet discussing design and production facilities for springs of all types, sizes and metals.

TUNGSTEN "Tungsten Electrodeposit Processes" is the title of a bulletin recently announced by Tungsten Electrodeposit Corp., Barr Bldg., Washington, D. C. This bulletin gives technical information and lists applications for which electrodeposited tungsten is being used.

WELDING Bulletin No. 3802, offered by Progressive Welder Co., 737 Piquette Ave., Detroit, Mich., discusses features of portable hydraulic welding guns and equipment.

PATENTS

February 15, 1938

Metal-Working Machinery

Sanding Machine. Tracy F. Brackett, Detroit, Mich., assigned to General Motors Corp., Detroit, Mich. Patent 2,108,193.

Abrading Apparatus. William A. Rosenberger, Hagerstown, Md., assigned to Pangborn Corp., Hagerstown, Md. Patent 2,108,210.

Abrading Machine. William A. Rosenberger and Walter L. Keefer, Hagerstown, Md., assigned to Pangborn Corp., Maryland. Patent 2,108,211.

Cutter Sharpening Machine (Grinder). William E. Sykes, Buffalo, N. Y. Patent 2,108,239.

Machine Tool (Multiple Spindle). Robert A. Schafer, Richmond, Ind., assigned to The National Automatic Tool Co., Richmond, Ind. Patent 2,108,297.

Roll Grinding Machine. Herbert J. Griffing, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,108,310.

Blind End Cylinder Honing Machine. Floyd A. Swanson, Rockford, Ill., assigned to Barnes Drill Co., Rockford, Ill. Patent 2,108,354.

Gear Lapping Machine. Edward R. Nyland, Detroit, Mich., assigned to General Motors Corp., Detroit, Mich. Patent 2,108,547.

Apparatus for Making Bolts or the Like. Lee A. Frayer, Kent, Ohio, assigned to The Lamson & Sessions Co., Cleveland, Ohio. Patent 2,108,709.

Multiple Machine Tool. Robert A. Schafer, Charles H. Muhl, Earl E. Opel, and John B. Beissman, Richmond, Ind., assigned to The National Automatic Tool Co., Richmond, Ind. Patent 2,108,779.

Parts and Mechanisms

Locking Device. Roy O. Allen, Athens, Pa., assigned to Ingersoll-Rand Co., Jersey City, N. J. Patent 2,108,032.

Frictional Motion Controlling Element. Rudolph W. Glasner, Chicago, Ill. Patent 2,108,059.

Variable Transmission. Edwin S. Hall, New Haven, Conn. Patent 2,108,062.

Extension Control Means for Tool Guides. Herbert E. Tautz, Milwaukee Wis., assigned to Delta Manufacturing Co., Milwaukee, Wis. Patent 2,108,086.

Combination Safety Slip and Drive Mechanism. William W. Criley, Cleveland, Ohio. Patent 2,108,165.

Worm and Worm Gear Assembly. Frank D. Jones, Ottumwa, Iowa, assigned to Dain Mfg. Co. of Iowa, Ottumwa, Iowa. Patent 2,108,262.

Fluid Operated Change-Speed Gear. Clarence T. Rogers, New York, N. Y., assigned to Edward T. Condon, New York, N. Y. Patent 2,108,270.

Stock Feeding Apparatus for Screw-Machines. Herbert E. Tautz and Martin Heinrich, Milwaukee, Wis., assigned to Herbert E. Tautz. Patent 2,108,274.

Rotating Shaft Controlling Apparatus. Vincent Liguori, Bayonne, N. J. Patent 2,108,315.

Feeding Mechanism. Ernest J. Svenson, Rockford, Ill., assigned to Sundstrand Machine Tool Co., Rockford, Ill. Patent 2,108,353.

Variable Speed Mechanism. Herbert E. Twomley, Riverside, Calif., assigned to Food Machinery Corp., San Jose, Calif. Patent 2,108,356.

Device for Transmitting Motion. Georges Raymond Cassagne, Cazaux, France. Patent 2,108,366.

Speed Change Device. Joseph D. Christian, San Francisco, Calif. Patent 2,108,367 and 2,108,368.

Speed Control Mechanism. William R. Perry, Columbus, Ind., assigned to Reeves Pulley Co., Columbus, Ind. Patent 2,108,410.

Means and Method for Turning Rotatable Objects to Predetermined Posi-

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RYERSON

tions. Le Roy J. Leishman, Los Angeles, Calif. Patent 2,108,538.

Power Transmission Mechanism. Roe Hutchings, Washington, D. C. Patent 2,108,586.

Elevating Mechanism. George W. von Hofe, Bound Brook, N. J., and Bernard D. Dans, Brooklyn, N. Y., assigned to New Jersey Machine Corp., Hoboken, N. J. Patent 2,108,628.

Nut Lock for Shears and the Like. Charles J. Dalley, Maplewood, N. J., assigned to The W. H. Compton Shear Co., Newark, N. J. Patent 2,108,654.

Fluid Pump. Joseph Paul Laird, Philadelphia, Pa., assigned to The Wicaco Machine Corp., Philadelphia, Pa. Patent 2,108,771.

Submerged Motor (Drilling Unit). Lawrence L. Schauer, Wyoming, and John H. McKewen, Cincinnati, Ohio, assigned to the Cincinnati Bickford Tool Co., Cincinnati, Ohio. Patent 2,108,780.

Cylinder Mounting for Hydraulic Motors. Lawrence L. Schauer, Wyoming, and John H. McKewen, Cincinnati, Ohio, assigned to The Cincinnati Bickford Tool Co., Cincinnati, Ohio. Patent 2,108,781.

Processes

Method of Cutting Gears. Ernest Wildhaber, Irondequoit, N. Y., assigned to Gleason Works, Rochester, N. Y. Patent 2,108,244.

Tools and Accessories

Pipe Point Welding Clamp. Van K. Robinson, Bremerton, Wash. Patent 2,108,077.

Chaser Holder for Die Heads. Royce M. Strickland, New Haven, Conn., assigned to The Geometric Tool Co., New Haven, Conn. Patent 2,108,149.

Apparatus for Determining Dew Point of Gases. Armor B. Martin, Butte, Mont., and Henry N. Wade, Los Angeles, Calif. Patent 2,108,173.

Drill Hole Cleaning Device. Raymond L. Crow, Lawrence, Kans. Patent 2,108,195.

Metal Cutting Tool. Harold C. Smith, West Orange, N. J., assigned one-half to Richard C. Johnson, West Orange, N. J.

Die Shoe. John C. Dense, Rochester, N. Y. Patent 2,108,253.

Screw Driver and Socket Wrench Attachment. Thomas Miller, Brooklyn, N. Y. Patent 2,108,344.

Cleaning and Polishing Block. John J. Kennedy, Los Angeles, Calif., assigned to Chamberlain Co., Inc., Los Angeles, Calif. Patent 2,108,405.

Measuring Apparatus. Charles H. Schurr, Cleveland, Ohio, assigned to The Lees-Bradner Co., Cleveland, Ohio. Patent 2,108,414.

Piercing Die. Jacob A. Smith, River Forest, Ill. Patent 2,108,619.

Grinding Device (Wheel). Avery W. Walker, Niagara Falls, N. Y., assigned to The Carborundum Co., Niagara Falls, N. Y. Patent 2,108,630.

February 22, 1938

Metal-Working Machinery

Machine Tool (Miller). John R. Johnson, Alexander Oberhoffken, and Ralph L. Cotta, Rockford, Ill., assigned to The Ingersoll Milling Machine Co., Rockford, Ill. Patent 2,108,821.

Machine Tool (Miller). Arthur H. Lyon, Rockford, Ill., assigned to The Ingersoll Milling Machine Co., Rockford, Ill. Patent 2,108,823.

Cutting Machine. Albert R. Thompson, San Jose, Calif., assigned to Food Machinery Corp., San Jose, Calif. Patent 2,108,951.

Sanding and Polishing Machine. Carl J. Lippold, Wauwatosa, Wis., assigned to J. M. Nash Co., Milwaukee, Wis. Patent 2,109,069.

Drill Grinder. Carroll E. Adams, Pawtucket, R. I. Patent 2,109,308.

Slotting Machine (Vertical). Louis G. Larsen, Jersey City, N. J., assigned to Wirthsen Associates, Inc., New York, N. Y. Patent 2,109,356.

Parts and Mechanisms

Hollow Crankshaft. Donald J. Campbell, Spring Lake Township, Ottawa Co., Mich., assigned to Campbell, Wyant & Cannon Foundry Co., Muskegon Heights, Mich. Patent 2,109,083.

Hydraulic Control for Drilling Rigs. William F. McMurry and George F. Phillips, Tulsa, Okla., assigned to Scientific Engineering Corp., Tulsa, Okla. Patent 2,109,297.

Processes

Method of Making Laminated Metal Blanks. Stephen L. Ingersoll, Chicago, Ill., assigned to Borg-Warner Corp., Chicago, Ill. Patent 2,109,010.

Tools and Accessories

Flashback-Resistant Blowpipe. Wilgot J. Jacobsson, Buffalo, N. Y., assigned to Union Carbide and Carbon Corp., New York. Patent 2,108,819.

Blowpipe. Wilgot J. Jacobsson, Elizabeth, N. J., assigned to Union Carbide & Carbon Corp., New York. Patent 2,108,820.

Socket Wrench. Sigmund Mandl, Milwaukee, Wis., assigned to Blackhawk Mfg. Co., Milwaukee, Wis. Patent 2,108,866.

Buffing or Polishing Wheel. Elisha W. Hall, Scituate, Mass. Patent 2,108,966.

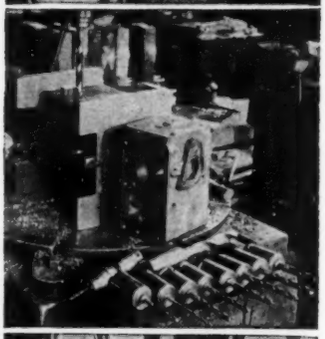
Apparatus for Fusing and Spraying Pulverized Substances. Fritz Schori, Wetzikon, Switzerland. Patent 2,108,998.

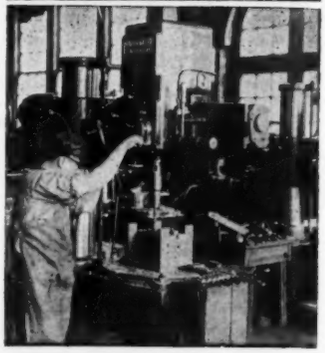
Drafting Apparatus. Fern D. Haselton, Newark, N. J. Patent 2,109,065.

Riveting Device. Howard Milton John-

SUPER-SERVICE RADIALS

The First Three Led To 12 More High-Speed Super-Service Radials





• These views show a few of the 15 High-Speed, All-Geared Super-Service Radials recently installed by a nationally-known manufacturer, whose work includes a variety of jobs like the one shown in the center photograph. Operations in sequence are as follows: Drilling —six 9/16", seven 13/32", and 7/16", one 3/8", one 15/16", one 29/64", one 21/64", one 3/16", one 1/2", one 1/4", two 1/8"—23 HOLES PER PIECE IN ELEVEN DIFFERENT SIZES.

In addition, eight holes are tapped. Ability to change over quickly in order to handle a wide range of hole sizes economically on Super-Service Radials makes their use particularly advantageous. Their speed and ease of handling will inspire your operators.

Ask our engineers to show you all the benefits of these modern machines.

THE CINCINNATI BICKFORD TOOL CO.
OAKLEY, CINCINNATI, OHIO

CINCINNATI BICKFORD

son, Toronto, Ont., Can., assigned to Massey-Harris Co., Ltd., Toronto, Ont., Can. Patent 2,109,067.

Portable Motor Knife Grinder. John R. Eadie, Jarvis, Ont., Can. Patent 2,109,107.

Blowpipe. Wilgot J. Jacobsson, Elizazeth, N. J., assigned to Union Carbide & Carbon Corp., New York. Patent 2,109,252.

Stamping Tool. Johan Kolstead, Hyde Park, Mass. Patent 2,109,253.

Die Holder and Guide. Blees C. Dimmick, Peoria, Ill., assigned to Keystone Steel & Wire Co., Peoria, Ill. Patent 2,109,312.

Where Limits Stop

Limits start in the drawing room; it takes only a fraction of a minute to write ±0.0002, and the extra zero behind the decimal point will mean that the designer is perfectly safe against trouble from liberal limits.

But too close limits can be just as troublesome as too liberal limits, and what is more, they are awfully expensive. When a shop has to work to "tenths" it has to watch every dust speck and even the way the operator handles his "mikes" and gages so a change in temperature won't cause them to exceed the microscopic tolerance permitted.

Shops equipped for fine work do not mind meeting exacting demands when they know that the specified dimensions are really required. What they do dislike is the obvious waste that comes from calling for "tenths" when the designer is merely playing safe and has no sound engineering reason for his decision. Here are a few examples:

A job shop received an order for several large rolls with the O.D. dimensioned at 7.6394 in. Carrying the decimal to the fourth place meant a careful measurement, and as the shop did a lot of fine work, it made certain to hold the diameters to a small tolerance. The manager of the shop happened to see these rolls when they were being assembled in the customers plant and noticed that they had been covered with felt. He was told that no particular accuracy was needed and on further inquiry found that the dimension had been obtained by dividing the desired circumference of 24 in. by 3.1416. The draftsman, to play safe, had simply carried out the dimension to four places.

Another shop got an order for gears. The limits in the pitch diameter called for ±0.0002 in. The same limits appeared on the outside diameter and on the root diameter of the teeth. Obviously the tooth face was the only surface that had any bearing. If any such tolerances were needed at all, they would be justified only at the pitch diameter. The root diameter depended on the cutter which would vary slightly with each resharpening. This practice of multiple tolerances, some of which are purely theoretical, is common.

This same shop had a man come in and ask for a 12-ft. straight edge. He did not specify any tolerance but said it should be pretty accurate. The proprietor suggested holding it within a thousandth and wondered if that would be close enough. The buyer said he guessed that would be all right as he wanted the straight edge to line up a brick wall.

A manufacturing plant on production work used a good many circular form tools, and as is commonly done, set them about 1/16 in. below center in the automatic lathes. The tool designer carefully computed the error in tenths of thousandths caused by the 1/16 in. undersetting of the tool, a process that took about five hours because of the irregular shape involved. He then put on limits of

9" x 3' South Bend Quick Change Gear Underneath Belt Motor Driven Precision Lathe on a manufacturing operation.

MODERN Industrial machining operations requiring speed, precision and versatility are being handled in hundreds of plants, tool rooms, and machine shops by the new 9-inch South Bend Series "T" Lathes. New features that insure accuracy and maintain it over a period of years, combined with fine workmanship and design, prove these lathes to be a profitable and productive investment.

68 Sizes and Types of Lathes for every purpose.
9" lathe prices start at $85
11" lathe prices start at $371
13" lathe prices start at $448
15" lathe prices start at $544
16" lathe prices start at $642

Write FOR BULLETIN

Bulletin No. 9-C illustrates, describes and prices the different models of the 9-inch lathe. Copy sent free, upon request.

SOUTH BEND LATHE WORKS
291 East Madison Street, South Bend, Indiana, U.S.A.

SOUTH BEND *Precision* LATHES
MODERN LATHES FOR MODERN INDUSTRY

0.004 in. which was accurate enough because the turned dimensions included a grinding allowance. Obviously the slight error in contour was lost in the limits allowed, and the five hours spent computing it was entirely wasted.

These examples could be multiplied many times. They serve to show that limits have their uses and abuses; the engineering department should stop using limits undiscriminately before the shop loses confidence in them entirely.

Machine Tool Selling—New Style

A. E. HENN
General Sales Manager
The National Acme Company

The machine tool industry as a whole has never taken kindly to any extended discussion of better selling methods, because in the mind of the machine tool builder the phrase suggests high-pressure selling. The very foundation of the industry is a close and intimate cooperation with a relatively small number of customers and a keen realization on the part of the machine tool executive that the future of his company rests on the continued satisfactory and profitable performance of the machine that he has sold.

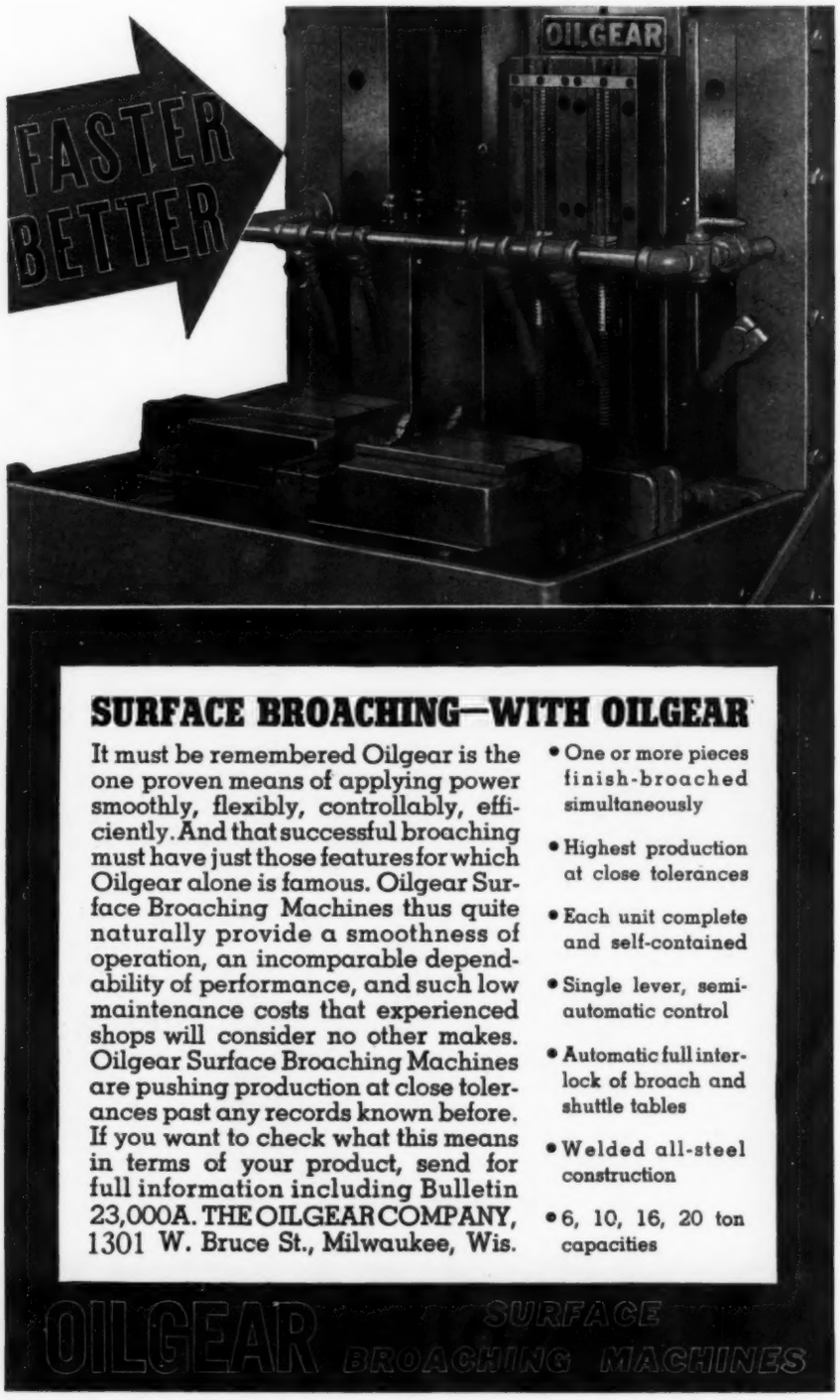
Nevertheless, if there is anything to be said for the machine tool, there is a good way and a bad way to say it. The development of a better sales technique would save customers a great deal of time and would undoubtedly increase the sale of machine tools at times when sales are desperately needed by the machine tool builder.

It is a regrettable but commonplace fact that customers must often resort to a practice of cross-examination in order to elicit the facts they need upon which to base their decisions. Fundamentally, it is the salesman's job to make it easier for the customer to arrive at a decision, and this implies that in each case the salesman must have given some thought to the interview and to have prepared himself with accurate data of the kind that the customer requires.

Certainly every experienced machine tool salesman realizes that there has been a gradual but decisive change in the selling technique of our field. Stress is no longer laid on knowledge of design and construction of the machine. That is taken for granted. We are now concentrating on the profits to the customer that will follow installation of the machine in his plant.

Bearing in mind again the character of our customers and of our business, it is obvious that a prepared presentation must not take the form of a memorized, stilted sales talk. Rather, the salesman should have firmly fixed in his mind an outline or an index of the major points that must be brought out in the conversation. These may be presented in his own words, and he may dwell for a longer time on such points as seem particularly to interest his customer. But if the discussion wanders off on a tangent to the main issue he must have the ability to come back and resume the thread of his conversation without wandering afield.

It naturally follows that a sales presentation of this kind must be based on the salesman's actual experience, or on the experiences of other salesmen in the same company, and it is certainly the function of a sales manager to act as a clearing house for these ideas. The sales-


OILGEAR
FASTER
BETTER
SURFACE BROACHING—WITH OILGEAR
It must be remembered Oilgear is the one proven means of applying power smoothly, flexibly, controllably, efficiently. And that successful broaching must have just those features for which Oilgear alone is famous. Oilgear Surface Broaching Machines thus quite naturally provide a smoothness of operation, an incomparable dependability of performance, and such low maintenance costs that experienced shops will consider no other makes. Oilgear Surface Broaching Machines are pushing production at close tolerances past any records known before. If you want to check what this means in terms of your product, send for full information including Bulletin 23,000A. THE OILGEAR COMPANY, 1301 W. Bruce St., Milwaukee, Wis.
• One or more pieces finish-broached simultaneously
• Highest production at close tolerances
• Each unit complete and self-contained
• Single lever, semi-automatic control
• Automatic full interlock of broach and shuttle tables
• Welded all-steel construction
• 6, 10, 16, 20 ton capacities
OILGEAR SURFACE BROACHING MACHINES

man must understand the financial side of the use of the machine in the customer's plant. He must understand something of the nature of the customer's work, of the organization and of his problem. He may have to make an actual survey of the customer's production conditions before he can present his case intelligently. He must know what depreciation is, what it has to do with the customer's finances and what bearing it may have on the purchase of new machine tools.

We frequently assist the customer to make a careful study of the profits that can be earned by a new machine and find a definite trend towards this analytical type of buying, especially among the larger companies. We cannot present a finished analysis because part of the data required must come from the customer's own records. We do cooperate by giving engineering layouts and estimates, which show what results can be secured, and assist in tabulating the data so as to show the percentage of profit that can be earned by the new machine—or, in other words, how many months or years will be required to earn back the investment required. No formula covers all cases and no stereotyped method can be applied; each customer has his own ideas on the relative weight of the considerations that apply. The fundamental idea, however, is simple enough, and we expect our salesman to understand it thoroughly.

We consider the careful preparation of sales helps one of our most important jobs, because they have a great deal to do with a successful sales presentation. If photographs are to be used, they should be selected carefully with the particular interview in mind. Printed circulars are open to the serious criticism that while the salesman is pointing to some particular detail in the photograph the customer's eye may stray over to the type matter and he may be reading something else. The salesman is not getting his concentrated attention and the customer is only half listening to what the salesman is saying.

Of course, it is unnecessary to add that the wise salesman will also come prepared to do some first-class attentive listening, as there is no better source for information that the salesman needs in his work than the customer himself.

It is still not appreciated among machine tool builders that advertising should supplement the sales presentation. Whether it be in technical magazines or direct mail advertising, the printed matter should be considered primarily as a sales talk in print and picture. Advertising should be based on the experience of the men in the field. It should stress those points which the salesman, by actual experience, has found most effective. We need not fear that they will become stereotyped through reiteration.

Naturally the experience of the salesman should also be reflected in the design of the machine itself, and a study of orders won and orders lost should be of great value to the chief engineer of the company. The information, if properly collected by the salesman and intelligently presented to his own organization, will point to the necessary engineering changes.

It naturally follows from these considerations that, as time goes on, we will be forced to give more thought to the proper training of salesmen. It is not enough that a man should be a skilled machine

Spring tempered
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Order From Stock
Scientifically heat treated to a true spring temper, "Rivett Mark" collets resist wear and hold their spring longer than collets of any other make. As standard equipment on all makes of lathes and millers, (see Rivett Bulletin 100B) they may be ordered for immediate delivery from the following stocks:—
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R. E. Ellis Engineering Co
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DETROIT
Charles A. Strelinger Co
140 E. Larned Street
BOSTON
Rivett Lathe & Grinder Inc
18 Riverview Road, Brighton
RIVETT
LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.

operator or a good demonstrator. What counts is not what the man has in his own head but the amount of information that he is able to impart successfully to his customer. It is not his own enthusiasm for his employer's product that counts, but how much of that enthusiasm he is able to impart to the man who should buy his machine.

By the very nature of things, the salesman is a connecting link, and his job is fundamentally one of human relations. He represents the customer in his contacts with the factory, and he represents the factory in his contacts with his customer. The most critical requirement of his work is his ability to transmit intelligence and to influence human beings favorably. It is not an easy task, especially when business is hard to get, and it is certainly not one that can be carried out successfully by instinct.

Abstracted from an article in *Executives Service Bulletin* published by Policyholders Service Bureau, Metropolitan Life Insurance Company.

GORTON
DUPLICATORS
Can you
Afford a Die Duplicator?
Wherever Gorton Duplicators can be operated through the week on average die and mold work it has been proved that they will pay for themselves in less than a year. Built along different principles from other machines reproducing dies and molds, they cost less and require practically no maintenance. The cutters, tracing styles, etc., needed are bought or made by the user at low cost.
A small forging die is set up here on the 8-D. Cut in alloy steel from stone composition model in 1½ hours to within .005",
Example No. 1395
Auger bit forging die. Reproduced from an original die on 8½-D Duplicator, complete in 2¼ hours. Accuracy limits — .002". Cutters used — Gorton single flute Momax in 5 sizes from ⅜" down to .025" dia.
GEORGE GORTON MACHINE CO.
1103 13TH ST., RACINE, WIS.

Education in Munition Making

Trial or educational orders for munitions and other war materials are again being proposed in the so-called Smith bill, now before the House of Representatives. The need for such preparation was pointed out by Hon. Louis Johnson, Assistant Secretary of War, at a gathering in Hartford, Conn. on January, 20, 1938. The matter is far more involved than may appear on the surface and should be given careful consideration by those who understand manufacturing problems. Experience gained in the last war should be utilized to the fullest extent.

One of the handicaps to production twenty years ago was the unnecessarily close tolerances demanded on many parts. Much of this difficulty was eliminated after the war by the then Chief of Ordnance, General C. C. Williams, one of the most practical ordnance officers we have ever had. Ably assisted by Colonel J. O. Johnson, now retired, General Williams eliminated many of the drawbacks of previous specifications as to dimensions of parts. There still remains, however, a great opportunity for simplification in design, in materials and in methods used in manufacturing the small arms, of which such great quantities are always needed. This criticism comes from ordnance officers themselves and has been embodied in reports to the Chief of Ordnance.

The last war showed the difficulties of getting into production on small arms and was the chief reason for adopting the Enfield rifle instead of the Springfield, considered by many to be the better arm. We had large factories making Enfields for the British, and it was wiser to change the cartridge chamber to fit Springfield ammunition than to equip plants with tools and gages to build the Springfield rifle.

We are dwelling on the rifle because that and the machine gun were the arms discussed by Assistant Secretary Johnson. He seemed to be worried lest there be a lack of factories capable of "performing the delicate jobs that may be imposed." The *ability* to make rifles need cause no anxiety. There are hundreds of shops working to as close tolerances as are required on even the latest machine gun. The pumps of electric refrigerators, pumps for rayon and many parts of automobile appliances are all held to closer tol-

erances than necessary in the rifle.

In any kind of mass production, tools and gages are the prime necessities. Every shop taking an "educational" order must either be supplied with these tools and gages or must procure them. On many kinds of work the cost of these might easily exceed the value of the comparatively small number ordered. It would be a waste of money for each shop taking an educational order to make or buy tools and gages for it, unless these tools and gages were delivered to the Ordnance Department with the parts made.

It would seem much better for the Ordnance Department to have extra sets of tools and gages made to be used by the manufacturer and returned with the order. This would insure uniformity in design and quality and would build up a stock of tools and gages that would be ready in any emergency. It would centralize responsibility for the correctness of the gages, and be much more economical in every way.

Auto Shops on Aircraft

While small arms are extremely important, we must realize the ever increasing part played by aircraft. One of our weaknesses might easily be in procuring aircraft engines rapidly. Engines of high power are really made by only two concerns, both on the Atlantic seaboard. Here again tools and gages are all important. With extra sets of these it would be possible for several of our best automobile shops to take educational orders in time of peace, or to get into production quickly in an emergency. Equitable compensation for the owners of the patents would be far cheaper than delay if war were imminent.

Shells, bombs and the like can be made with fewer special tools, as we know from the last war. Gages, however, are necessary from the beginning. These should also be supplied by the Ordnance Department and be returned to it with the completion of the order. Special tools and machines can be made as occasion requires.

Objection may be raised that many of these tools and gages may become obsolete through changes in design. While this is true to some extent it is much less the case than in the average manufacturing business. Insurance of any kind costs money.

We are heartily in favor of educational orders. We suggest that they begin with tools and gages for whatever material is likely to be needed first in an emergency. When a few sets of these are ready, educational orders for the parts themselves can be placed in carefully selected shops. Wise selection is most important from every angle. Neither politics nor favoritism of any kind should play any part in the allocation of orders. While we have no delusions as to this being fully possible, it is the goal toward which all right-minded citizens should strive. Putting work in the wrong shop might spell disaster in an emergency. Too high a price adds to taxes for years to come.

For the Sake of the Job

We earn a better living today, under conditions more nearly approaching social justice, than ever was possible before. Most of us agree on that. We may disagree on how and why it came about. Has it come through industry, or was it forced on industry? Many people believe that

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metered
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The correct oil film to each individual bearing . . . automatically
● Machines remain efficient . . . stand up . . . only when properly lubricated. With the Bijur Automatic Lubricating System, each bearing is served by its own meter-unit. The lubricator pump measures a predetermined quantity of oil feed to the distribution system; the meter-units apportion the feed to the individual need of each bearing—whatever its size, speed, load. Unfailingly . . . automatically. No lubrication problems, worries, profit-eating expense!
BIJUR LUBRICATING CORPORATION • LONG ISLAND CITY, NEW YORK
BIJUR
AUTOMATICALLY Correct LUBRICATION
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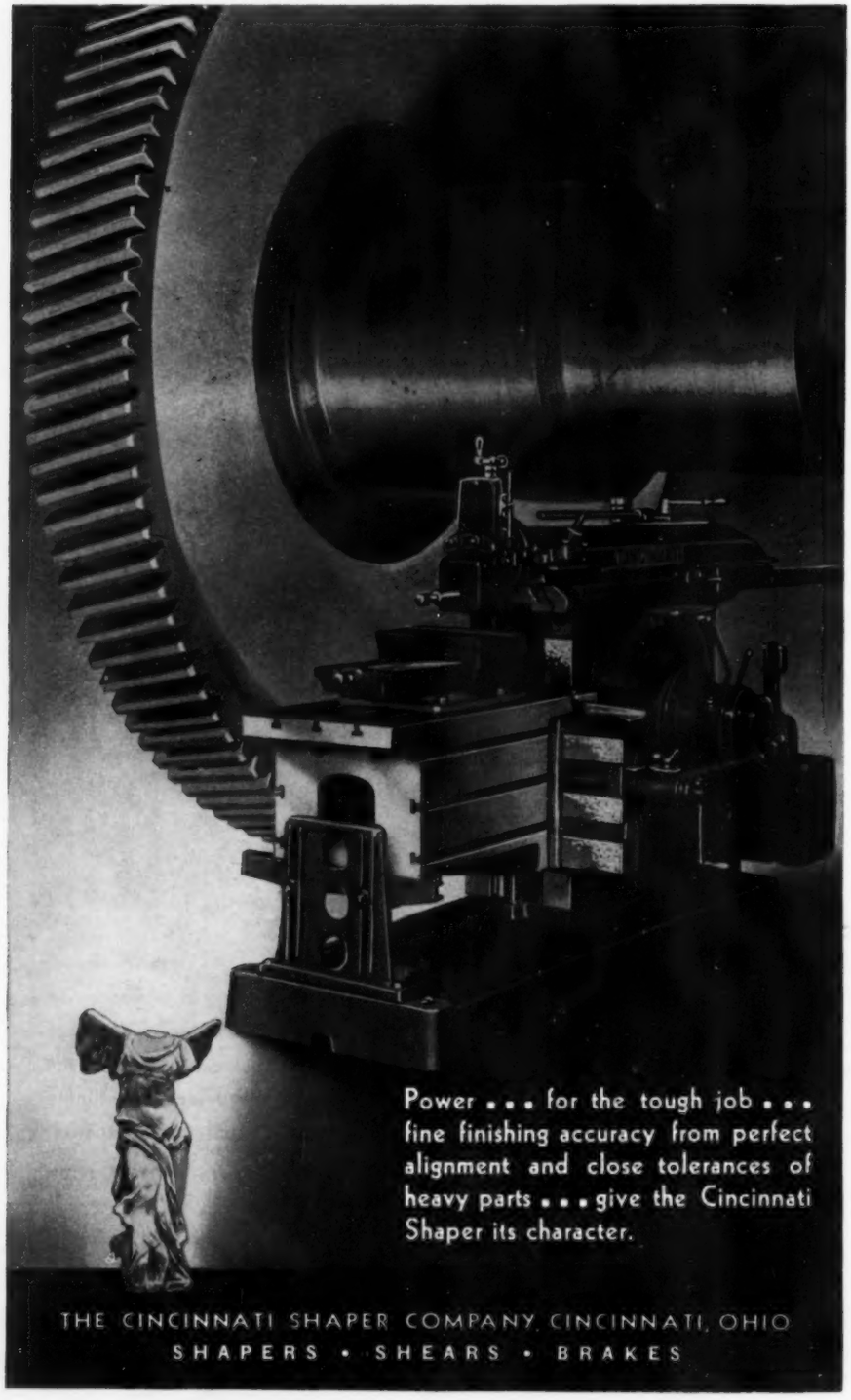
some compulsion from the outside is responsible—they cannot conceive industry taking a forward step except under the lash—they think that legislation compelled it or organized pressure forced it.

Those who hold this view and wish to keep it should shun economic history, for that tells us that the sins of industry were not industrial in their origin but were inherited from society;—they flowed into industry from the earlier English system of household labor that now seems so romantic to the uninformed. Subhuman working conditions of all sorts—long hours, low wages, child labor—all came into the factory from the home-crafts. They were not condemned, they were not even noticed in the homecrafts, but in the factory, whose principal interest was the job, their evil character was very quickly recognized—not primarily because of the human harm they wrought, but because they interfered with the job. Progressive managers began to reform them—for the sake of the job. Parliament refused the reform for years, the working people themselves opposed it, thinking that fewer hours of work would mean a scantier living. The reform was forced in, not by the pressure of society upon industry, but by the pressure of progressive industry on backward society, and that is largely the story of industrial social advance ever since.

Besides the undoubted improvements now firmly established, management has experimented with a long list of other methods that seemed to promise social benefit but in practice hindered it—they did not work out. Some of these are being demanded today, as if they were new discoveries, and under pressure some of them have been adopted, but no amount of organized duress or legislative compulsion has ever yet been able to make the unworkable work.

The best that legislation ever does is to establish by law what forward-looking industry already has established in practice. The best a justified strike ever does is to force into the backward places what the progressive places long have enjoyed. No statesman, no non-employing leader ever has conceived, suggested or demonstrated an improved industrial relation; it is first conceived, tested, proved, and built into industrial practice by management.

Abstracted from a radio address by W. J. Cameron, Ford Motor Company.


Power . . . for the tough job . . . fine finishing accuracy from perfect alignment and close tolerances of heavy parts . . . give the Cincinnati Shaper its character.
THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO
SHAPERS • SHEARS • BRAKES

Versatility of Equipment

JOHN E. HYLER
R. G. LeTourneau, Inc.

One of the things to be considered in purchasing equipment is versatility. There are many men who buy a piece of equipment for a special purpose, put it to work and pay no further attention to it other than to see that it turns out its quota of work.

There are doubtless a number of users of portable belt sanders who are well pleased with the ripple-free jobs they turn out but who never stopped to consider that the same machine equipped with a belt adapted to cutting metal would give good results in smoothing metal jobs. Even if they had, it would probably be some time before they discovered that by the use of a belt specialty adapted to the purpose, such a machine is very useful in removing old finishes. It is possible to use attachments that will permit the belt to nose up into interior corners or to use a shoe that will permit it to conform to slightly rounded surfaces.